Engineering Library

Electrical World

MARCH 23, 1940

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X-RAY EXPLORES CONDITIONS OF POLES

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"CONFUCIUS say:
'CURRENT THEFT STOP WHERE MURRAY SEAL BEGIN!'"
By leaving definite evidence of tampering they detect current diversion. The Murray Padlock Seal is embossed with utility name; each may be numbered for quick identification; each may have lead insert for special marking. They last and last and last, because their smooth, deep-dip galvanized finish withstands every extreme of weather. Send for a free sample of this widely approved, time-tried, economical discourager of current theft. Metropolitan Device Corp., Brooklyn, N. Y.
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Send sample and quote on
_____Murray Padlock Seals.
Also, send free of charge, new wire clip.
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Utility_____
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What Happens to the Banana

For several years there has been a growing acknowledgment of mutuality of interest between the utilities and the manufacturers of electric appliances. The evidence is the number of market promotion campaigns, financed by the manufacturers and jointly directed.

It hasn't always been easy for the manufacturers to raise the funds, because lean years and development expense haven't left an awful lot in the till. Nevertheless, there has been a continuance.

Have these campaigns helped to sell appliances? Have they helped to build load? Each year at the E.E.I. Sales Conference there is ample testimony to their effectiveness. The results may not be the same in every case, but the fact is that the campaigns have been a worth-while factor in building domestic load.

These campaigns cannot continue without mutual confidence and co-operation—the two-way kind. These campaigns, in a way, are like a marriage—there must be give and take. Neither side can lay down the law or be autocratic. Each side must recognize the problems of the other and try to help in their solution.

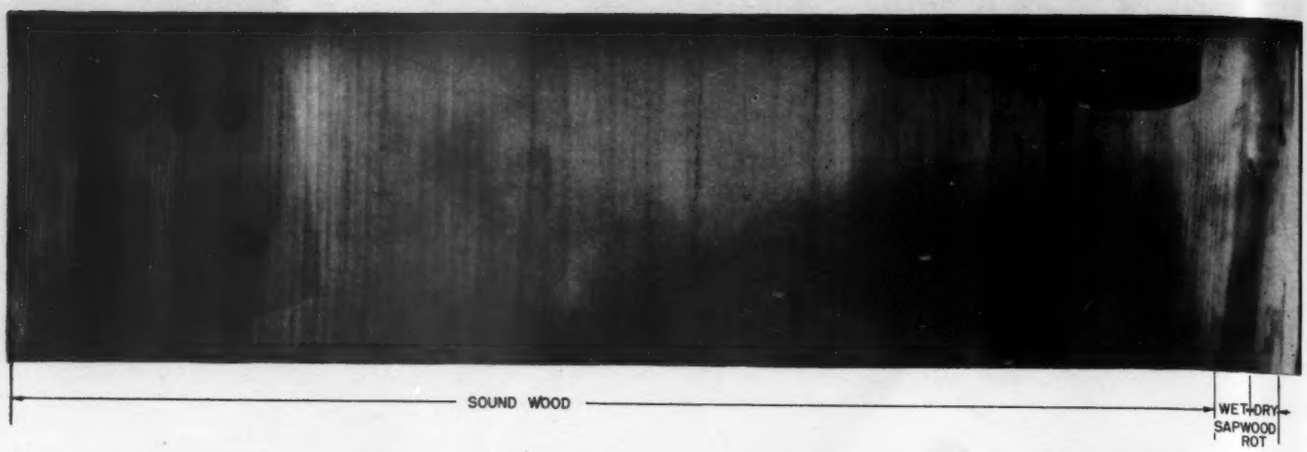
It must also be recognized that such campaigns are business affairs. If there is not an opportunity for growth and profit for both sides, there will be no campaign. The utility benefit is not merchandise profit, but added load. However, the dealers who sell the most of the volume must have a reasonable profit or the incentive is gone.

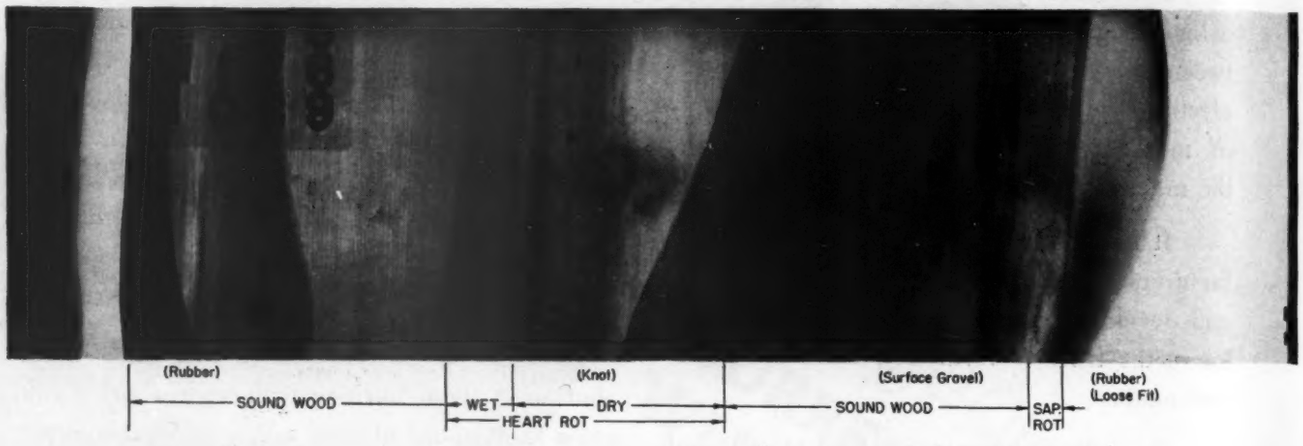
These product campaigns will be in jeopardy if utilities should bring out under their own names or otherwise subsidized devices at substantially lower prices. The manufacturers who are financing the national promotion would feel that such action would be trading on a price that promotion created. A local all-industry promotion wherein all factors enjoy reasonable profits should produce better long-range results.

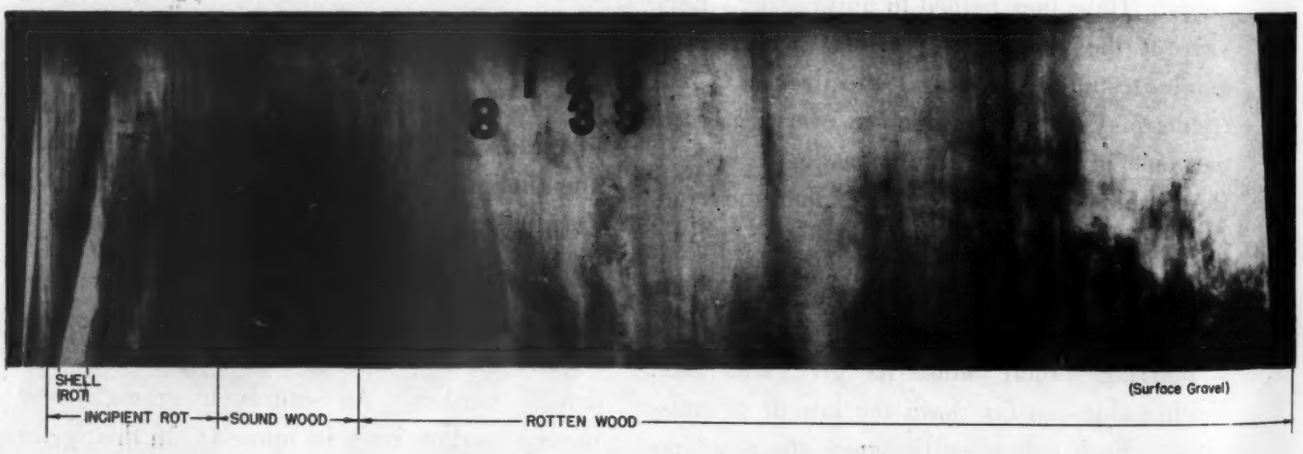
There is no question in any one's mind but what these utilities with such a price can in a short space of time sell considerably more units than they could at the higher price, but soon the special low price becomes the standard in that community and the price appeal loses its effectiveness. In the meantime if the national promotion ceases the buyers turn their attention to other wares that are being promoted. Eventually the load from this device is less.

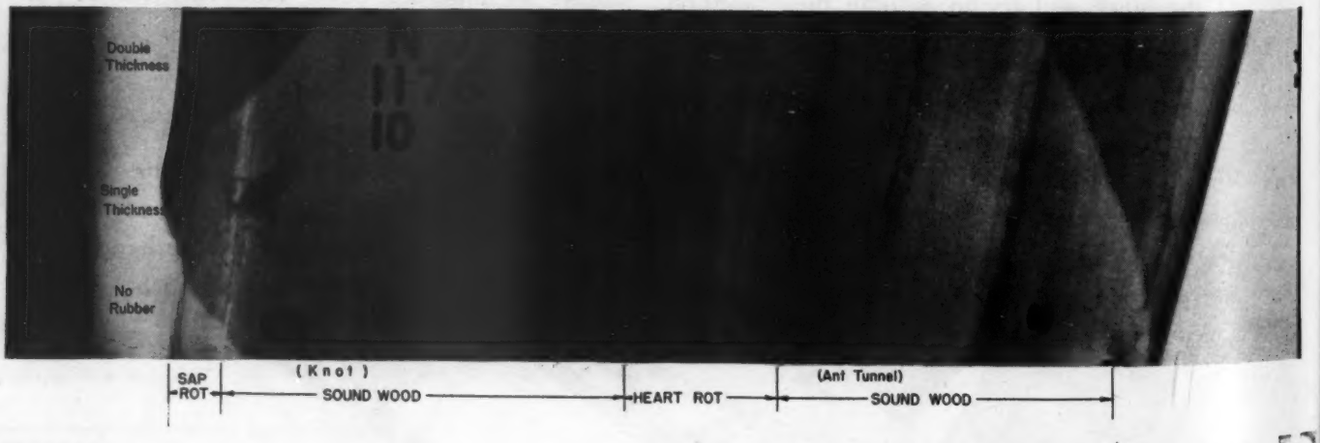
One must have sympathy for the problem of the utility. Lower rates and higher costs require an unrelenting attack upon the residential market. As saturation grows, lower income markets must be opened. In this, price plays an important part. However, it must not be given such a leading role that the rest of the cast quits.

It would be most unfortunate if one or more of these promotional campaigns were to lose financial support because somebody began rocking the boat. We all know what happens to the banana when it leaves the bunch—it gets skinned.


SOUND WOOD
WET
DRY
SAPWOOD ROT


(Rubber)
SOUND WOOD
WET
(Knot)
DRY
HEART ROT
(Surface Gravel)
SOUND WOOD
SAP ROT
(Rubber)
(Loose Fit)


SHELL ROT
INCIPIENT ROT
SOUND WOOD
ROTTEN WOOD
(Surface Gravel)


Double Thickness
Single Thickness
No Rubber
SAP ROT
(Knot)
SOUND WOOD
HEART ROT
(Ant Tunnel)
SOUND WOOD

X-Ray Pole Inspection a New Engineering Tool

Detroit experience shows that X-ray inspection of wood poles at ground line is superior to boring in accuracy and economy — New technique permits strength calculation with engineering accuracy

MYRON ZUCKER, Engineering Division, Detroit Edison Company, Detroit, Mich.

MOST electric utilities have adopted some program of inspecting their distribution and transmission poles, motivated by the current desire to improve service with decreased cost. Boring and probing tests have admittedly not been altogether satisfactory. We are now proposing a new method for pole inspection, one that gives results with engineering accuracy, does not damage the pole and leaves records by which the progress of rot can be studied. This method is to take pictures through the pole, using a modern, light-weight X-ray machine. Sufficient work has been done by the Detroit Edison Company to indicate that X-ray inspection is accurate, practicable and economical, although there are still a number of unsolved problems and unanswered special questions.

It is natural to ask if X-rays can really show the difference between good and rotten wood. A few trials on discarded pole butts more than two years ago gave the pictures reproduced herewith. The extent of sound, dense wood and of weak or missing wood is clearly shown by the difference in shading and in appearance of "grain." Amplifying these basic ideas, a set of "diagnostic rules" has been drawn up, by which the boundaries may be confidently found from the radiographs of any pole.

As a result of this discovery, development was begun. Preliminary tests led to the selection of the simplest of five possible types of X-ray inspection, X-rays penetrating the pole and falling on film that records the resulting shadow. We chose a portable X-ray machine that had re-

***RADIOGRAPHS* show sound and rotted wood (opposite page)**

All prints are positive—*i. e.*, dark parts have received less X-rays than lighter. Lead numbers are code for pole number, species, map section numbers, month and year. Black dots are rivets holding belts to rubber pads. It is unfortunate that these reproductions have inescapably lost so much of the quality of the original films. Distinctions mentioned in the discussions were often clear on the radiographs, even though they may not be too convincing in the prints shown here.

N-36/281—Sound wood except for sapwood at right. Shadow near right is ground rot with molding clamp at top. Note uniform tone of picture showing absence of bad rot, also sharp fiber boundaries in good portion.

39 N-176—Heart rot with sapwood rot at ground line on left. Film shows limitations of interpreting by density for the rotten central fibers; dry on one side—wet on the other, appear respectively darker and lighter than adjacent good wood. Shows also stages of decay; wet fibers badly rotted and stringy; dry ones still have some substance, but have lost strength.

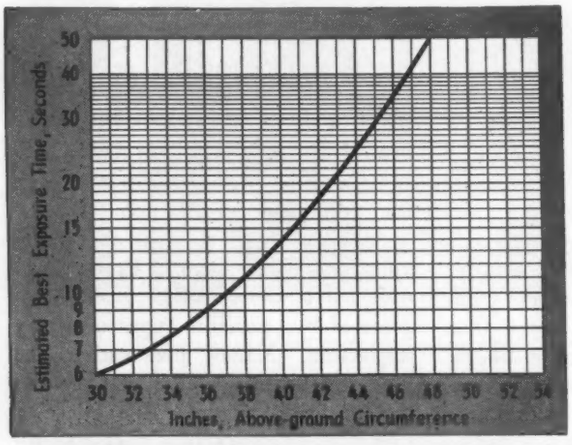
W-12/125—Practically nothing but dirt in this picture. There is almost no wood to absorb rays and cast a shadow. Contrast is shown at left, where some shreds of sound wood do appear.

N-7/1176—Northern cedar pole, sapwood rot on right, shell rot on left and a little heart rot (that probably existed where tree was cut). The knot—sinuous trace at left—is sound. In this radiograph, change of density is of little use except to confirm the shell rot, which otherwise shows up only as the disappearance of one year's wood. Effect of rubber girth is seen by difference in tone where one, two or no layers intercept rays.

DIAGNOSTICIAN ANALYZING RADIOGRAPHS — Two negatives are being viewed through light box. Upper film shows removal of sapwood near ground with shell rot above ground (at left), reducing effective diameter to same as lower portions. Lower film shows how hollow heart may be recorded as dark area. Buckle of girth appears near center

cently been produced for medical work and proceeded to develop the technique of its use—X-ray voltage and current, distance between tube and pole, type of film exposure time and artifices necessary to make consistently clear pictures.

Even before these problems were solved we made some tests to convince ourselves of the accuracy of the method and inspected enough poles in the field to assure ourselves that the process was feasible. Every consideration indicated that X-ray *should* be accurate, but we wanted to verify this. Therefore, a series of poles were first tested by boring, then X-rayed, and then loaded to destruction. The average strengths calculated from radiographs exceeded the actual strengths by only 16 per cent, which is but little more than might be expected from a comparison between computed and actual strengths on new poles. The breaking loads completely verified the X-ray condemnations, which differed considerably from boring selections. These tests not only showed what accuracy could be expected from radiographic analysis but emphasized that engineering methods can be applied (including calculation of future strength upon assumption of some reasonable rate of decay), whereas boring depends so much on the personal element that erratic results are almost to be expected. We felt satisfied, then, that in any future discrepancy between boring and X-ray condemnations we should assume the X-ray to be correct.



EXPOSURE TIME DATA for pole X-raying—Curve for Westinghouse Diadex X-ray generator, No. 3 voltage, 10 milliamperes, AGFA no-screen film. Tube-film distance 36 in. This is offered as an illustration of trends, not as a working curve

By the fall of 1939 we had equipped our first truck. As nearly as we can judge from this initial construction, we could assemble a unit for $1,000 to $1,500, exclusive of the truck. Using the first mobile set, a two-man crew inspected 75 poles per day. Poles that appeared solid were given only visual and sounding inspection, according to the usual custom. Two boring crews independently tested halves of the same area. With the relatively crude equipment and methods then in use, the cost of inspection by X-ray—labor, materials, transportation and depreciation of apparatus—was 2½ times as much as the cost of the boring test. Labor costs were nearly the same for both methods — requiring about ten man-days, including office work. Cost of film was the principal added item for X-raying. It averaged 30 cents per pole X-rayed or 9 cents per pole in the area. Several methods of reducing this differential are in sight.

The higher cost for X-raying was justified, however, by the savings in pole replacement. There were 300 poles in these areas. The borers condemned 28, or roughly 10 per cent of the poles. X-ray condemned eight of these *plus* two different ones, or 3 per cent of the total. Thus, the X-ray gives at least three more years of life to 20 poles, or 71 per cent of the total condemned by boring. The annual charges on this saving in pole replacement more than cover the added inspection cost. Note, also, that 20 per cent of the weak poles found by X-ray were not condemned by regular testers. Thus, X-ray removed some poles which would otherwise have remained as hazards to service.

Potential savings can only be estimated from this experience, which involved relatively crude apparatus and which covered only a limited sample of overhead line construction. Analysis of results indicated that this sort of difference could be expected in most cases due to inherent limitations of boring tests. X-rays at a moderate cost avoid these difficulties and give real meaning to the term "pole life."

These comparisons and tests, while limited in number and scope, make us feel that we can profitably utilize the theoretical advantages of X-ray inspection to decrease pole replacements, better service and study rates of decay.

We are continuing our experimental work with three aims—to refine certain parts of the technique of taking and interpreting films, to answer certain unsolved problems and to cut costs. Concurrently, our overhead lines department is planning a more extended field trial.

Experience so far has shown the following disadvantages of inspecting poles by X-ray:

1. Increased cost of inspection.
2. Special training of crews.
3. Return trip to field to mark condemned poles.

These are more than offset by the advantages:

1. Decreased pole replacement through actual dimensions of good wood being obtained by a specialist trained in interpreting films.
2. Application of engineering principles to determination of strength, with real consideration of progress of rot.
3. Possession of permanent records.
4. Eventual lengthening of pole-inspection intervals.
5. Possibility of working all year round.
6. Possibility of a systematic study of decay from year to year in poles under various conditions of soil, moisture, chemistry, wood species and treatment.

Basic Technique

Development of the X-ray technique is interesting not only for its own sake but to point out why the present process was adopted and why things are done as they are. The first steps were obviously to find whether X-ray would distinguish between solid and decayed wood, to satisfy ourselves that rot really showed itself consistently, and to choose the *best* method of examination. "Best" in this case meant the cheapest routine that would be safe, accurate, simple, rugged and reliable.

The first method tried was to look directly at the light from a fluoroscopic screen held in the X-ray beam

as it emerged from the pole. This was abandoned because it gave too little detail and left no record. Next, ordinary radiography as performed in hospitals was tried, on the supposition that a pole is like a human chest, at least radiographically. In this process X-rays are passed through the pole to a fluorescent screen in a metal box called a "cassette." The screen lights up, producing a "shadowgraph" of the pole. This image is photographed on a film in the cassette, in close contact with the screen. This method was handicapped by high investment (each truck would have to be provided with enough cassettes and screens to take a day's run of pictures) and by certain relatively delicate accessories that would be required for best results.

The technique finally adopted was "non-screen" radiography. The X-rays emerging from the pole register directly on a film that is especially sensitive to this wave-length. The film is wrapped in light-proof paper. This simple, practically fool-proof technique yields clear pictures, as shown in the illustration. Early trials showed that good wood absorbed more rays than rotten wood or a cavity, and this was reflected in the film density from which the soundness of wood might be judged.

With this basic process in mind, a mobile field unit was designed. Power was first taken from secondaries, and later from an improvised rotary-converter set in an emergency lighting truck. Two unsuspected technical problems arose immediately—the effect of moisture in the pole and lack of details at edges of large poles.

Detecting Rot

The variable moisture content of poles—as opposed to the dried condition of those in the warehouse—almost ruined the "diagnostic value" of the films; wet rot was apt to absorb more X-rays than good wood, and so appear sounder on the film. However, this difficulty turned out to be a disguised blessing, because it led to a complete change of film interpretation. Study showed that structure of the fiber was a better indicator than gradation of film density had ever been. Good wood has precise, smooth-flowing fiber boundary lines; when decay starts to affect strength, grain lines "wabble" and separate slightly but unmistakably. When decay is bad, fibers appear stringy, corky or absent. Analysis of the films is now, therefore, based on fiber structure, with film density as a supplementary indicator.

TWO MEN can X-ray a pole; when sapwood is sound above ground radiographs may be used to find heart rot

The second difficulty was that if the films were properly exposed at the center for large or unusually dense poles we had a "blackout" at the edges, because too many rays penetrated the outer pole layers. No grain could be seen. This initiated further laboratory study, which ended with strapping a simple rubber X-ray-absorbent girth around the pole. This evens the film density, so that clear pictures are obtained for any pole size and degree of rot.

At this stage the major activity was transferred from warehouse to field. A pick-up truck was equipped to facilitate work. A Westinghouse "Diadex" X-ray machine, rated at 85 kv. (peak), 15 milliamperes anode

[*Continued on page 108*]

X-RAY EQUIPMENT may be carried on light truck; X-ray machine is at right, in its stand on the "calipers" and held in place by rods which go through holes on tailboard; in this position it can travel short runs between poles. Controls are on top shelf of central cabinet, films and incidentals in left-hand compartment

*Vaults for A.C. Secondary Networks—I**

Vault Shell Materials and Layout Proportions

Nation-wide survey of prevailing practice shows range of trends as to use of concrete or brick, wall and roof thickness, equipment space and general arrangement of equipment in network vaults

JOHN S. PARSONS, Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

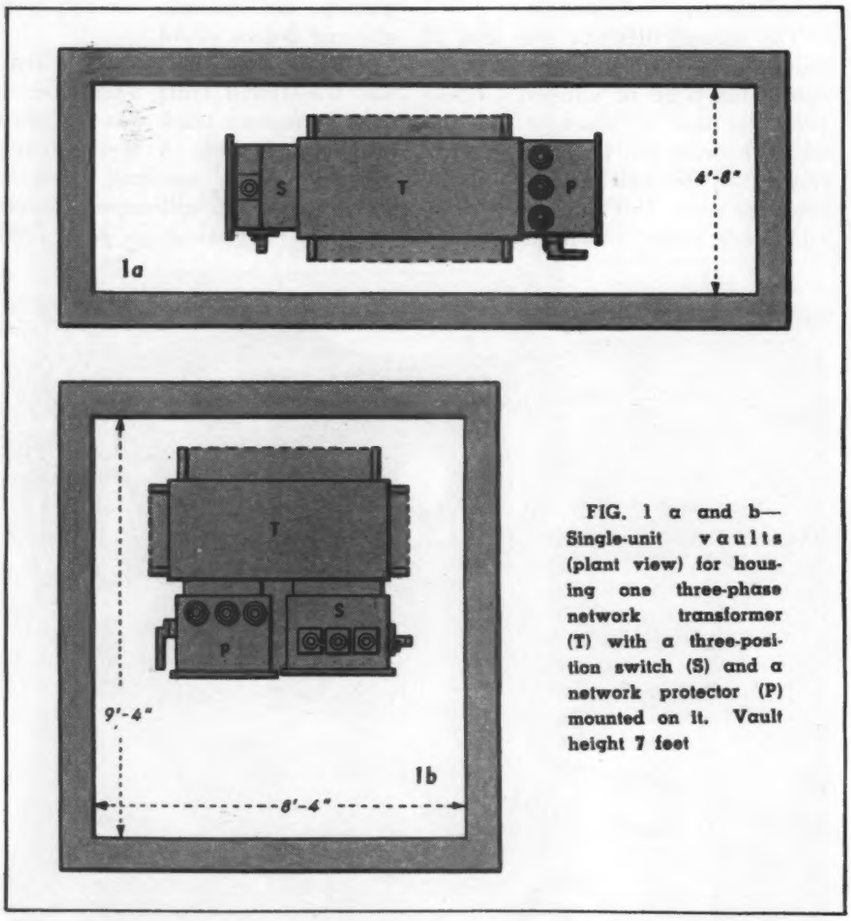


FIG. 1 a and b—Single-unit vaults (plant view) for housing one three-phase network transformer (T) with a three-position switch (S) and a network protector (P) mounted on it. Vault height 7 feet

REINFORCED CONCRETE is by far the most generally used material in the construction of network vaults. Even in the relatively few instances where brick walls are used the floors and roofs are of concrete. Reinforced concrete is no doubt so generally used because it is much stronger, has better heat conducting characteristics and is easier to make watertight than brick construction. Brick walls cost less than reinforced concrete, which accounts for their use in some cases.

The thickness of concrete walls used varies from 6 to 22 in., the average being 10 in. Neglecting the one special case where 22-in. walls are used, the average wall thickness was 9.5 in. It is not unusual to make the street-side wall of a sidewalk vault thicker than the other walls or to make the two side walls of a long vault thicker than the end walls. The most commonly used wall thicknesses appear to be 8 in. and 12 in. Where brick walls are used the most common thickness appears to be about 13 in. All vaults studied had concrete floors varying in thickness from 4 to 12 in. The average floor thickness was 7 in.; however, the most commonly used thickness was 6 in.

The majority of vaults are located under sidewalks because it permits a less expensive construction, facilitates maintaining the equipment and simplifies the problem of ventilation, because it is undesirable and frequently impossible to use open gratings in the vault roof when the vault is located under a roadway or alley. Even if gratings are permitted in such locations, heavier and more expensive ones are required. In some cases, due to the sidewalk being narrow or for some other reason, a sidewalk vault will extend a few feet beyond the curb under the roadway. Here a heavier roof construction will usually have to be used, at least for that part of the roof under the curb and roadway. The vents in this case, however, will be located in the sidewalk and covered with the usual sidewalk grating. The roof thickness for sidewalk vaults varies from 4 to 14 in., the average

* The second and third installments will appear in early issues of *Electrical World*.

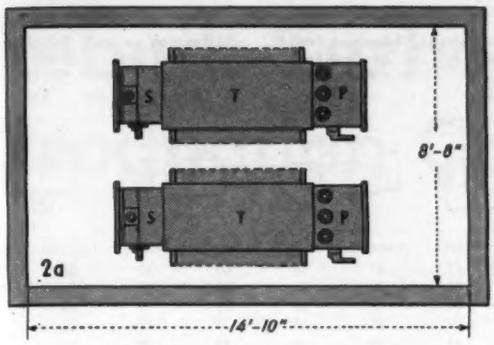
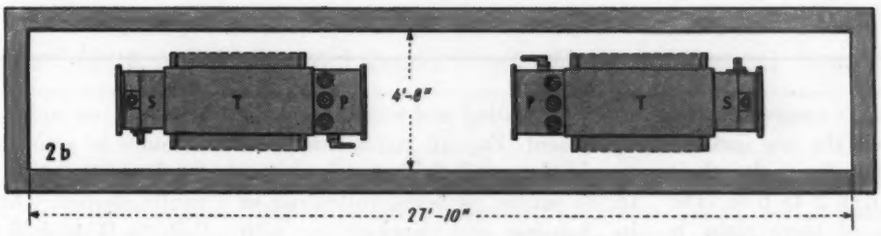
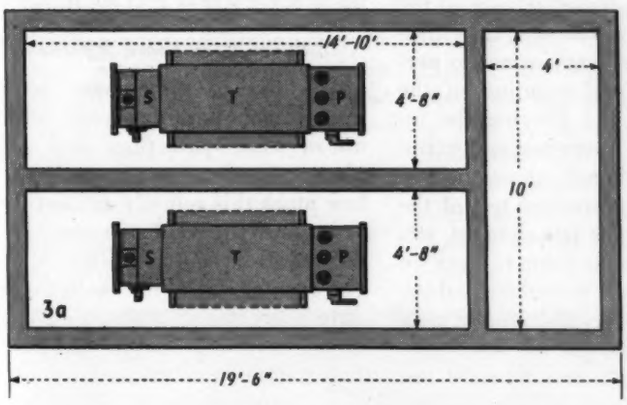
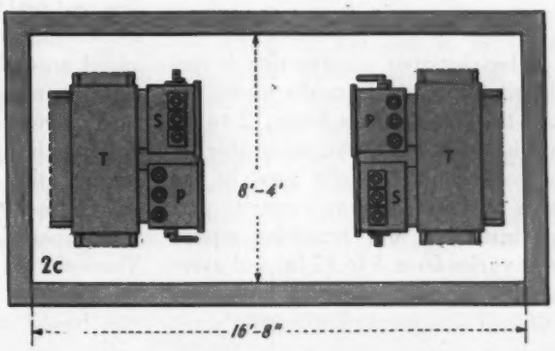


FIG. 2 a, b and c — Multiple-unit vaults for housing two network units similar to those of Fig. 1 and without any structural separation between the units or any inclosure for secondary bus







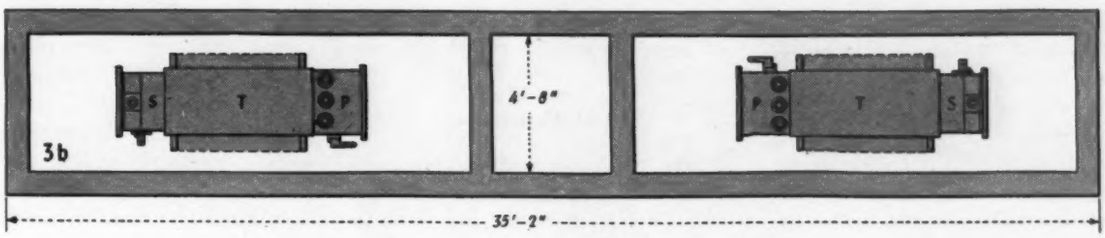
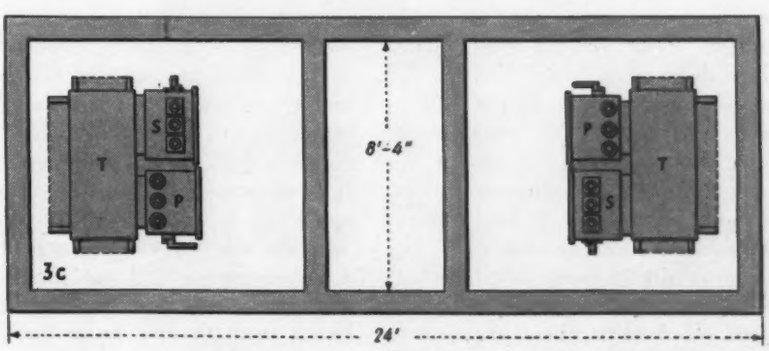


FIG. 3 a, b and c — Multiple-unit vaults for housing two network transformers, similar to those of Fig. 1, in separate compartments and having a separate secondary bus compartment



Three-Phase Transformer, Kva.	Height of Unit	APPROXIMATE OUTLINE DIMENSIONS IN INCHES OF TRANSFORMER WITH— 3-Position Switch on One End, Protector on Other End		3-Position Switch and Protection on Same Side		3-Position Switch on One Side, Protector on Other Side		3-Position Switch on One Side, Protector on End		3-Position Switch on One End, Protector on Side		3-Position Switch on One End		3-Position Switch on One Side	
		Length	Width	Length	Width	Length	Width	Length	Width	Length	Width	Length	Width	Length	Width
150	55	90	32	56	54	56	62	78	43	67	54	67	32	56	43
225	55	93	33	57	55	57	63	82	44	68	55	68	33	57	44
300	57	93	35	64	56	64	63	83	44	73	56	73	35	64	44
450	62	96	40	71	59	71	64	88	47	78	59	78	40	71	47
500	62	96	40	71	59	71	64	88	47	78	59	78	40	71	47
600	67	104	42	79	61	79	66	98	49	86	61	86	42	79	49
750	75	107	45	82	64	82	69	101	52	89	64	89	45	82	52
1,000	81	110	52	85	71	85	76	104	59	92	71	92	52	85	59

T=Transformer. S=Three-position switch. P=Network protector.

being 8 in. When removable reinforced concrete slabs are used in the roofs of sidewalk vaults their thickness varies from 2 to 6 in. The average thickness of these slabs is 5 in.

Roadway Roofs Reinforced

A heavier roof construction is employed for roadway vaults where the roof thickness ranges from 12 to 15 in. The thickness of the removable reinforced concrete slabs used in the roofs of these roadway vaults to permit installing and removing equipment varies from 5 to 12 in. and averages 7.5 in. In most vaults, both sidewalk and roadway types, the roofs are reinforced in various ways by means of steel I-beams usually embedded in concrete. A recent type of roof construction is one in which the entire roof consists of a grating supported in a removable steel frame. In some cases the frame carries both gratings and a reinforced concrete slab. This type of removable roof, which is usually about 7 in. thick, results in some savings in the depth from the street surface to the inside surface of the roof.

The considerable variation in wall, floor and roof thickness of the vaults studied is to be expected. These dimensions are influenced by the size and shape of the vault, the type of earth surrounding it, traffic conditions, the necessity to design for pressures due to floodwaters and explosions, and special requirements imposed by local ordinances.

The minimum possible dimensions of a vault are determined by the space required by the equipment to be installed. These dimensions should be increased sufficiently to provide room for testing and maintaining the equipment. Enough room should be provided around the network protector to permit its being rolled out of its housing and worked on with safety, so as to permit testing, adjusting and making minor repairs in the vault. Sufficient space should be provided around the transformer to permit inspection and painting of the tank, sampling and filtering the insulating liquid, operating and maintaining the primary three-position switch, making a pressure test of the tank, operating the tap changer, etc. There should also be room to work on the primary and secondary cables, and bus if any. In addition to providing sufficient space for the equipment and its safe maintenance, the vault should be made large enough to accommodate the largest rating equipment which a reasonable forecast indicates will be required at the location.

Local Variations

There will, of course, be cases where the vault dimensions are affected by local conditions, such as other subsurface structures, rock, rental on underground space, etc. In these cases physical impossibility or excessive cost makes necessary some reduction in the size of the vault below that which is desirable. There are also cases where vaults are made considerably larger than necessary. It is always important to utilize the space in a vault as effectively as possible, and the convenience of unnecessary space will not justify the additional cost of constructing a larger vault than is necessary. It is appreciated that what constitutes necessary space in a vault is largely a matter of opinion. This probably accounts to a considerable extent for the large variation in the size of the vaults studied. The size varies from 0.38 cu. ft. to 4.39 cu. ft. per kva. of installed transformer capacity and the average size is 2.33 cu. ft. per kva.

3-Phase Uses Space Effectively

The use of three-phase network transformers permits a more efficient use of vault space than does single-phase transformers. Some idea of how much this actually amounts to as determined by vaults in use can be secured from the following figures: The average size of the vaults housing three-phase transformers is 2.17 cu. ft. per kva., while the average size of the vaults containing banks of single-phase transformers is 3.04 cu. ft. per kva. In other words, the single-phase transformer vaults are 40 per cent larger than the three-phase transformer vaults. This large difference in size is, to a considerable extent, accounted for by the practice of designing network vaults for single-phase transformers with a single opening in the roof for installing and removing the three or more units. Under this condition space must be provided in the vault for moving any transformer from its normal operating position to a position under the equipment opening without disturbing the other units. If an opening were provided over each transformer a considerable reduction in vault size could be made over what is usually encountered. Even if this were done, however, there would still be an appreciable space advantage in favor of the three-phase unit.

There should be some small space

[*Continued on page 105*]

Rebuilt Turbo-Unit Trims Production Costs

25-cycle unit converted to 60-cycle and back on the line in 120 days — Capacity increased 6,500 kva. and the station economy improved as result of factory rebuilding of former 25,000-kva. unit

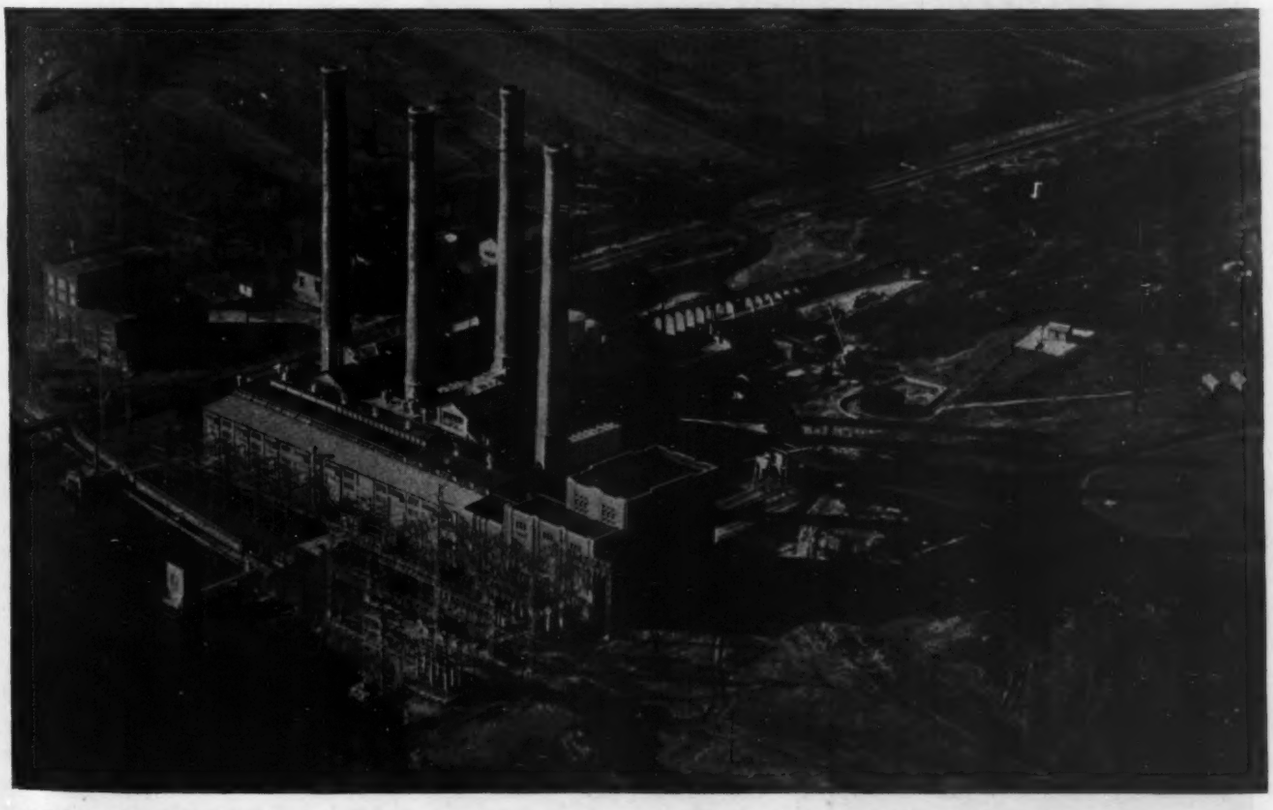
GEORGE W. IREY and E. J. DREWELOW,† Empire District Electric Company,‡ Riverton, Kan.*

INEXPENSIVE CONVERSION of an existing 25-cycle generating unit into a modern 60-cycle turbo-generator at the Riverton station of the Empire District Electric Company provided needed additional 60-cycle capacity plus a 6,500-kva. increase in the unit's rating at nominal cost and a lowering of the station's production expense.

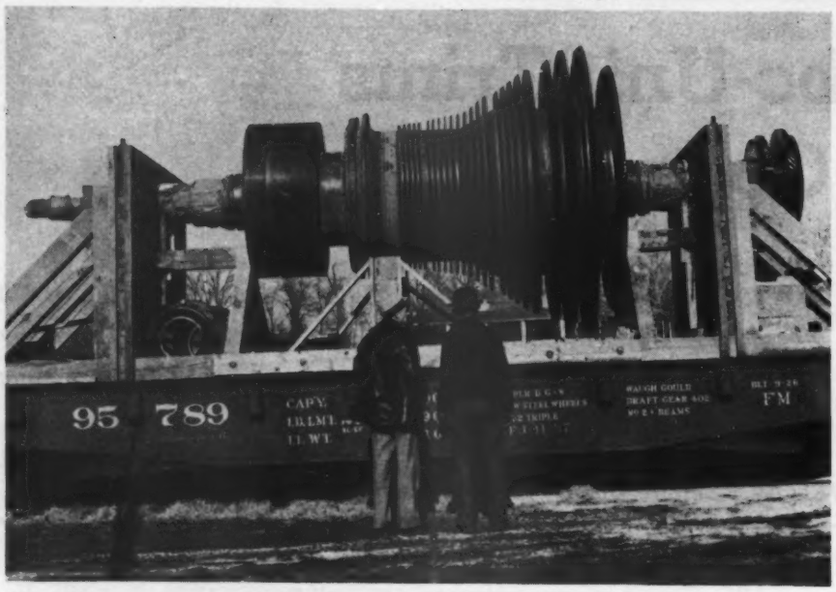
Operation of the converted unit has been highly satisfactory. Economy of the combined turbine and generator at the new speed of 1,800 r.p.m. and most efficient point of 28,500 kw. (non-extraction) was found to be only one-half of 1 per cent poorer than that estimated for a new machine operating under specified conditions of 205 lb. gage, 150 deg. superheat and 28-in. vacuum. The unit selected for the conversion was the only machine of five in the station equipped with a surface condenser, the others being mounted over jet condensers. Also, steam rate of the converted machine is from 20 to 40 per cent better than the older units in the station.

Thus, the increase in capacity of the most efficient machine in the station has permitted a reduction in generation by less efficient prime movers at a very material saving in both fuel and cost of chemicals to condition feedwater formerly required for generation on units

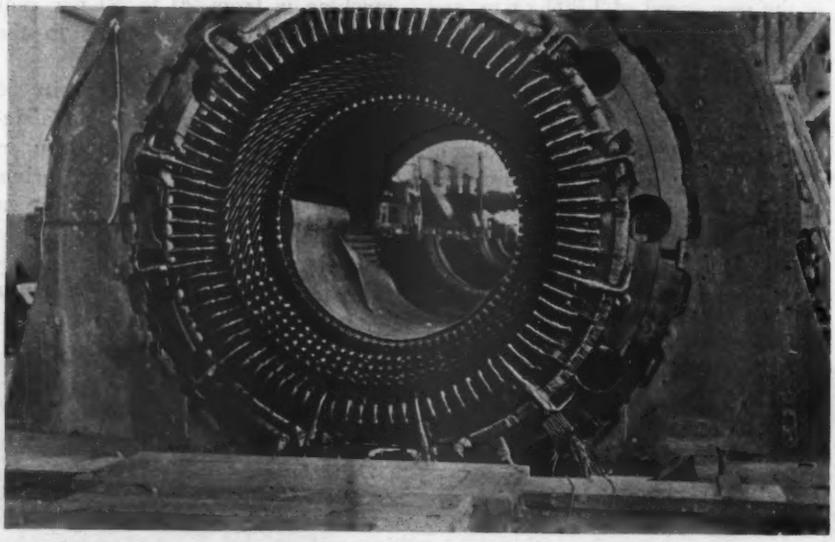
*Plant superintendent. †Chief engineer of plant. ‡Electric Advisers, Inc., engineers.



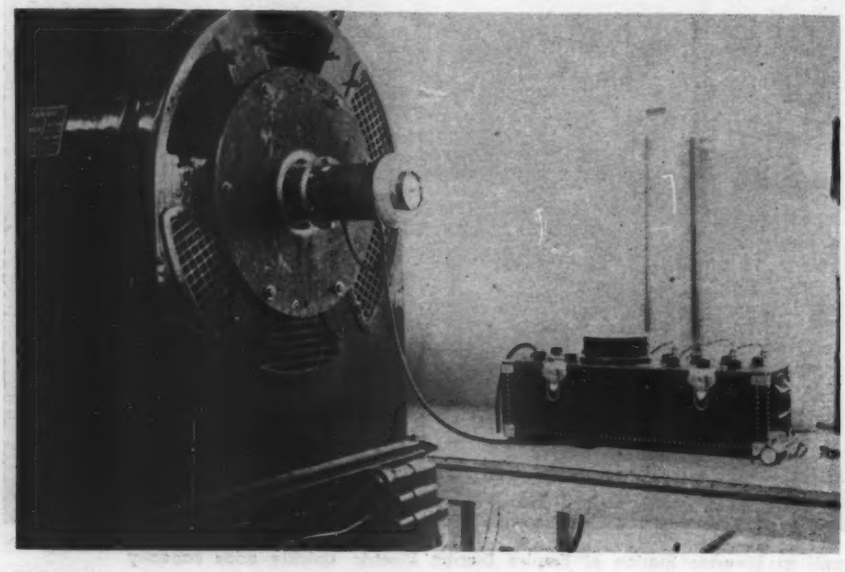
MODERN METHOD of rebuilding 25-cycle unit at Riverton Station of Empire District Electric quickly adds capacity



REBLADED AND REROTORED element arrives for installation



STATOR WINDING in original cast-iron frame; top half in place and bolted down



BAKER electronic balancer set attached at exciter end

equipped with jet condensers. This latter item is appreciable when it is considered that make-up on the station varied from 40 to 60 per cent of the total steam requirements.

Using a factory-built pre-wound stator incorporating latest advances, the turbo-generator unit was placed on the line exactly 120 days after being shut down for the rebuild. Changes to the prime mover to meet the requirements of additional capacity and 60-cycle frequency involved new governor drive gear, new valves and nozzle blocks, removal of several rows of blading from cylinder and spindle and regaging of blading for increased steam flow. Advantage was taken of the outage to modernize the surface condenser, which procedure involved steam lancing and measures to increase the flow of condensing water to meet the demands of an increase in steam flow at the new machine rating. Condensate removal equipment was similarly rebuilt to handle increased unit output.

In Transition 25 to 60 Cycles

The Riverton station of the Empire District Electric Company, a Cities Service Power & Light Company subsidiary, is the largest steam plant in Kansas. Situated in the extreme southeast corner of Kansas, it serves, through the lines of the above company and other associated companies, about 40,000 customers, composing 135 communities located over an area approximately 150 miles square in the adjoining states of Kansas, Oklahoma, Missouri and Arkansas. One of the principal industries in the mining of lead and zinc had reached a total of 62,500 kw., all energy generated being 25-cycle. The 60-cycle load on the system was supplied through small converters located at such load centers as were necessary.

Growing demand for 60-cycle supply, due to acquisition of property and conversion of domestic and small power customers from 25 to 60 cycle, led to two changes. The first move was to make steam capacity at Riverton available to meet 60-cycle requirements and consisted in the installation of a 25,000-kva. converter in 1928. The second was the rebuild of the hydro-electric station on the White River at Ozark Beach, Mo., in 1930. Here the old 25-cycle units were abandoned and in the new extension were installed four 4,000-kw., 60-

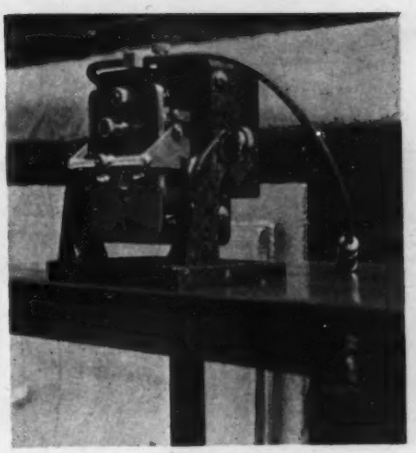
cycle wheels. The frequency changer unit installed at Riverton formed the electrical interconnection between a 25-cycle system of 66,000-kw. capacity, steam and hydro on one side and 16,000 kw. of 60-cycle hydro capacity on the other side of the tie.

Continued development of 60-cycle load soon necessitated provision of further 60-cycle steam-generating capacity due to unavailability of 60-cycle hydro capacity in the dry season. With 25-cycle power demand now virtually limited to the major lead and zinc mine and milling operations, an excess of 25-cycle steam capacity resulted and led to the decision to convert one of the existing 25-cycle prime movers to 60-cycle operation.

Unit Rating Raised One-Fourth

The unit selected for the conversion was a Westinghouse 25,000-kva., 80 per cent power factor, 6,600-volt, three-phase, 25-cycle generator and type 328 CW, 1,500-r.p.m., 200-lb., 550-deg., four-stage bleeding turbine. Specifications called for a generator rated 31,250 kva., 80 per cent power factor, 13,800-volt, three-phase, 60-cycle, with turbine rebuilt to deliver 27,500 kw., operating at 205 lb. gage, 150 deg. superheat, 28-in. vacuum, with four-stage bleeding.

This particular turbo-generator was originally put in operation in March, 1925, and had a service record of 96,190 hours, or approximately an 80 per cent service factor up to time of shutdown, December 23, 1938. Machine output for this period totaled 1,501,612,200 kw.-hr., for an average loading of 15,610 kw., or a capacity factor of 62.48 per cent.



VIBRATION AMPLITUDES in three directions ascertained at each pedestal

Advantage was taken of the latest methods developed for modernizing old equipment. This consisted of installing a complete Westinghouse factory-built pre-wound stator in the original frame. This pre-wound method greatly simplified the usual difficult and tedious problem of winding in the field, and not only saved considerable outage time of the unit, but permitted taking advantage of factory manufacture of the stator winding.

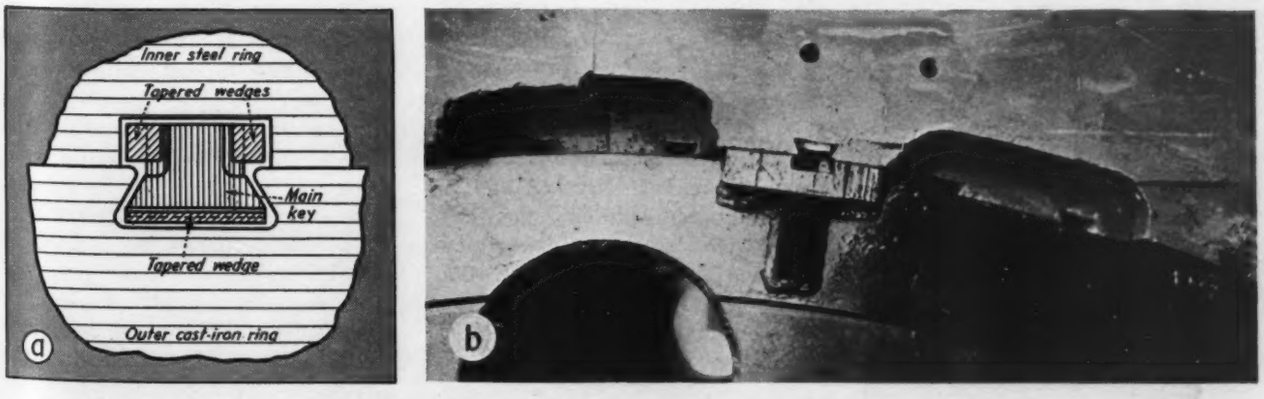
The rebuilt stator incorporated the most recent developments in alternating current, turbine-generator construction and practices in insulation, coil treatment, bracing, ventilation and low-temperature operation. Pre-wound construction of such type was made possible, primarily, through use of the highest grade silicon steel for the stator limitations, thereby reducing radial depth of iron required and allowing for a structural steel, skeleton type inner frame in which the new punchings and windings were assembled at the factory. This frame then served as an adapter to the original cast-iron frame, which is split and bolted together at the horizontal centerline.

Frame in Six Rings

The inner frame construction consisted of six heavy circumferential members in the form of steel rings. Each ring was slotted in 24 places on its periphery to match the dovetail slots that originally held the punchings in the old frame. These rings were also slotted on their inner circumference to receive axial bars to which the new stator laminations were keyed. All joints of this steel inner frame were welded to form a rigid structure. The finished stator had an over-all length of 89 in., diameter 130 in. and a total weight of approximately 44 tons.

A special form of multiple-taper key was used to secure the inner frame to the outer frame. The bottom section of the major key, machined to fit the dovetail slot in the generator frame, was made with the under side tapered (0.005 to the inch). A tapered wedge was driven in between the bottom of the dovetail and the key, thus locking it

[*Continued on page 110*]



NOVEL KEYING holds pre-wound stator in old frame

(a) The upper part of the key that fits into the keyways of the inner frame was made with both sides tapered and narrower than the keyways, to allow for a tapered wedge to be driven in on each side, at 144 places where the new inner frame is keyed to the cast frame. This method assured perfect keying at every point regardless of possible misalignment between dovetail and inner-frame keyways. All tapered wedges were secured in final position by welding to the main key and to the frame.

(b) The inner frame was also keyed at each end, top and bottom, to prevent axial movement. The diameter of the inner frame was finished 0.005 to 0.010 in. larger than the bore of the cast-iron shell to provide a clamping effect on the inner frame when the halves of the outer frame were bolted together.

Vigorous Promotion Builds Commercial Cooking Load

Potomac Edison System accelerates commercial growth by load analyses, combating competitive fuels, introduction of new equipment, dual usage, follow-up to prevent load mortality

W. C. CONLEY, Jr., Potomac Edison Company, Hagerstown, Md.

SALES PROMOTION plans and programs for connecting commercial electric cooking and baking equipment to the lines of the Potomac Edison Company could all be summed up by saying that they have consisted of activities involving persistent hard-hitting methods. Daily contact and demonstration work, year in and year out, supported by convincing direct mail, has enabled our company to build its commercial cooking load to a point where it is now considered one of the major activities in the system's load-building program.

Kilowatts added under the commercial cooking and heating division of commercial men's work are as follows:

1936	643 kw.
1937	662 kw.
1938	693 kw.
1939 (nine months only)	754 kw.

Our men also connect certain water heaters and types of farm load. Fifty-two per cent of the sales were heavy-duty equipment going into hotels, institutions and the like. Twenty-seven per cent was counter and pantry equipment, and the remainder (21 per cent) was made up of miscellaneous heating equipment.

Our company is located in a comparatively rural area and serves some twenty-five towns, the largest of which is about 40,000. We have 9,693 commercial meters, of which approximately 800 represent food service establishments. The commercial cooking department is made up of one full-time supervisor and six commercial representatives, whose activities cover commercial lighting and air conditioning in addition to their commercial cooking work. Currently we are connecting through the efforts of this group a load of more than ¾ kw. per food service establishment.

Company Sells

We promote the use of commercial electric cooking and baking equipment because we have found that we cannot secure the sales coverage through the kitchen supply houses that contact our area. None of the suppliers have headquarters in our territory, and naturally their salesmen, traveling out of the metropolitan cities, spread their time very thinly over all types of kitchen equipment, so much so that they apparently cannot take the time to do justice to the promotion and sale of commercial electric cooking equipment. However, we welcome their efforts and we will continue to co-operate with them in every way possible. As things are now, we are firmly convinced that the bulk of the electric business now being sold would go gas, coal or oil if we were not on the firing line.

To create interest in commercial electric cooking we have prepared sales manuals for all of our key people and solicited the help of the merchandise salesmen handling the household appliances. This help has proved very valuable, particularly in the outlying sections, where they can do the bird dogging and our commercial representatives can follow and close the business. In addition, schools have been held to acquaint our home economics department and

service department with our work. The home economists are often called on to assist with demonstration work and our service repairmen, having a knowledge of what the equipment is supposed to do, are in a much better position to keep it in repair. The assistance of these groups has been invaluable.

We try to arrange our program so that the buying public will have little chance to forget about our story. In addition to the regular contact calls and the direct mail, we have several selling aids and plans which have proved very valuable for our work.

Display Car

The first and most outstanding one is a commercial display car, in which is displayed a complete line of cooking equipment, including a commercial type range. The car has been used for several years. It is routed to each of our districts for a period of one week, during which time the commercial representative actively uses it for promotional and sales work in the territory he serves. The displays are changed frequently, and whenever a new item suitable to our area is announced to the industry it is placed in this car, to learn of the customers' reactions. Our aim is to make the display attractive enough and new enough that a customer will welcome the visit as a means of finding out what is new in the industry.

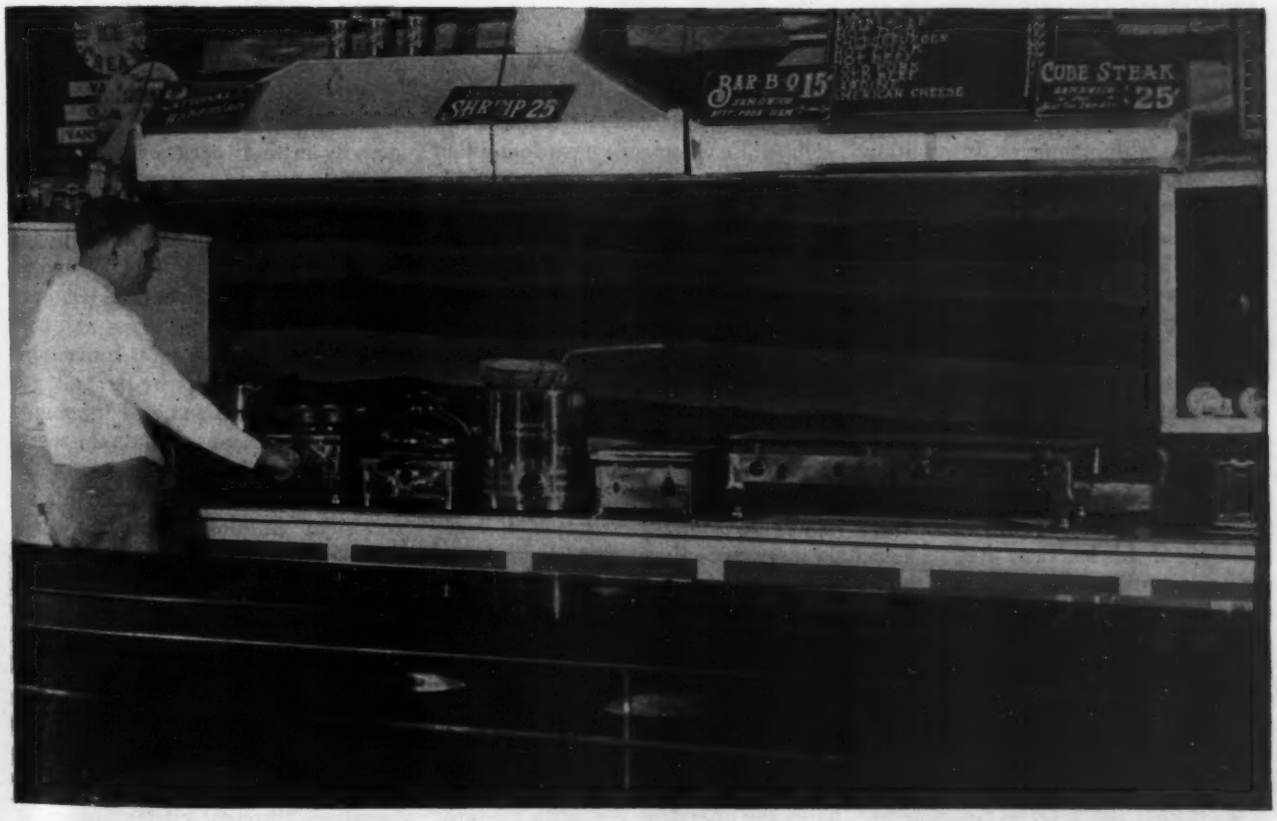
The car is fine for those customers who lean toward the electric way and are now using some pieces of commercial electric cooking equipment. There are, however, many customers who first have to be convinced that the electric way is fast, practical and economical. We are constantly planning and developing ways and means of approaching this type of customer.

Customer Observation

One way we have found successful has been to secure the permission of the customer to observe his kitchen under actual operating conditions. From this observation we learn many things that we would not know otherwise. Maybe the proprietor has been giving us the deaf ear, and yet we find that the chef is actually interested. He may tell us that the boss actually needs a fry kettle and that he feels the menus could be improved if they had one. We usually find conditions a lot different in the kitchen than the proprietor has told us, and many cues are picked up in this way.

A careful study of the customer's demand is included in our program. These studies often reveal cases where additional equipment can be added without materially increasing the billing demand. To conduct these studies, we temporarily install a graphic type demand meter. The charts tell us exactly when the valleys and peaks occur, and frequently we find valleys where the commercial electric cooking and baking load will fit in without raising the peak. Bakeovens particularly can often be operated during the off-peak periods, as the baking time can usually be changed to the period when the valleys occur, without upsetting the routine of the establishment.

As a final resort, when tips cannot be picked up from a kitchen observation or a study of the demand does not look encouraging, we try hard for a trial installation of a fry kettle.



LOTS OF LOAD in not so big kitchens— This modest 10-15-25-cent Pennsylvania inn has a connected load of 30.3 kw. in electric cooking. In the view are a 4.5-kw. Griswold griddle, 4-kw. Griswold hot plate; not shown, a 12-kw. Edison range. Fifty-nine kw. of electric cooking equipment is packed into the complete electric kitchen at Frederick, Md., shown on the opposite page. Largest load items: A 16.5-kw. Edison Husky range; 8 kw. of Griswold fry kettles; 8-kw. Westinghouse range; 6-kw. Griswold vertical broiler. A 126-kw., three-deck bakeoven is located in adjoining bakeshop.

I mention fry kettle because some of our hardest jobs have been sold in this manner. The fry kettle is outstanding in that it offers many more advantages than any other electrical appliance we can recommend. The use of a fry kettle is more effective than anything else to convince the customer of the merits of electric equipment, and the fry kettle usually paves the way for additional equipment.

New Product Need

As new products are brought out we immediately investigate them and arrange to offer anything of value to our customers. We feel this is important, because one of the retarding factors of the industry as a whole is that there are not enough new products to keep it interesting for the buyer. The buyer is looking for new equipment, new designs and new applications that will attract the eating public, and there are too few being presented at this time.

An item that was introduced several years ago, and which we immediately began selling, was the induction unit designed for commercial applications. The unit was new in design and answered the old objection of electricity being too slow. We featured the unit in our display car, and wherever the field men went they used it as a door opener. In addition to receiving many orders for this item the unit served as a medium for creating customer interest in electric equipment, and out of it we were able to sell other appliances. Following this same line of thought, we have featured glass and dish sterilizers, barbecue machines, hot food storage receptacles, waterless food servers and oyster cookers, with an equal amount of success.

We have looked for new uses for the equipment we regularly sell. One example of this has been that we have sold one-gallon coffee urns without the pump and basket for serving hot chocolate. One more has been the use of an electric stock kettle for cooking oats on a horse farm—the farm, incidentally, being a famous one that recently saddled a Kentucky Derby winner.

We conducted a large commercial show in which commercial electric cooking and baking equipment was displayed, along with commercial lighting, air conditioning, refrigeration and ventilation equipment. Commercial customers were brought in by chartered buses from all the distant points and taken through this exhibit. Our purpose was to acquaint them with all the electric equipment that was available for commercial establishments and, in turn, show them how it could be adapted to their particular businesses. The response was far greater than we had anticipated, for the customers, after seeing the equipment in actual operation, were impressed and many placed orders for pieces of equipment that we had never sold before. The food service operators particularly found new and novel uses for electric appliances.

The food service operator is always confronted with the two problems of holding his present customers and attracting new ones. He is interested in learning of anything that will help him solve these problems. Electric cooking and baking equipment offers him a chance to improve his menus, make his back bar more attractive and improve the quality of the food. We can help him by visualizing the possibilities.

Load Insurance

Selling equipment is one thing. Keeping it on the lines so that you are assured of the load year after year is another, and sometimes more difficult, problem. We have found that the only sure way of protecting this load is to be checking constantly with our customers to determine whether the equipment is operating satisfactorily and is being used regularly. These check-ups often reveal cases where customers bought equipment in good faith, and then for some reason later decided to shelve it. Our commercial representatives are continually looking for such instances, and part of their job is to try to find a way to place the equipment back in use. Sometimes this requires an exchange of equipment. Perhaps the reason the customer has become dissatisfied is because his business has outgrown the piece of equipment he orginally purchased. Again you may find that the installation was made many years ago, and as a result it is inefficient, when the customer compares the operating cost with modern fuel equipment.

Solving these problems indicated to us that as time goes on and the equipment, both the electric and fuel type being supplied by the manufacturers, becomes more efficient, part of our job will be to devise a plan for renewing the equipment of the older installations. The loss in the load as a result of the new, efficient equipment we feel will be made up many times by public knowledge of the fact that electric equipment has become cheaper to operate.

Tank Gas

Another problem that we are continually battling is the tank gas competition. To date we have prevented this competition from securing a foothold, but it is the type of opposition that you are never sure that you have licked. It spreads quickly, and then will quiet down in one area and crop up in another.

We have found that in most cases the operating cost claimed for it by the gas people cannot be substantiated. Their story is attractive, though, for they operate in areas where people have not used gas and they stress speed and economy. Human nature seems to want to try something new. The gas people endeavor to capitalize on this, emphasizing particularly the speed of the giant burners compared to the electric units.

Our commercial representatives immediately report any competitive activity in their area, and frequently supervisory help is sent out from the general office to assist with the jobs. Many interesting cases develop and we keep the entire field personnel advised of the progress we are making in the various areas and how the competition was met. Indications point to more activity by the tank gas industry now that some of the major oil companies have taken up the work.

All of this brings us back to the point of accomplishing our job by persistent bulldog methods, which although comparatively simple, have served us in good stead. Summing up the work we are doing, our activities result in our continually telling our customers the commercial cooking and baking story through the mediums of personal contact, demonstrations and direct mail. The display car, the analysis of the customer's operation through kitchen observations, the study of demand charts, the introduction of new equipment, the unusual applications, the com-

[*Continued on page 107*]

Human Relations Smooth Public Relations

Knowing and being known in friendly, human terms is the simple formula for good public relations and is the essential job of every one in the utility organization

•

RALPH V. H. WOOD, ***Philadelphia Electric Company***

FAR DISTANT in the murky past is the faggot purveyor who gathered his stock in trade along the forest paths and hawked it through the village ways. Yet he, supplying torches for light and fuel for rude hearth fires, is the prototype of the modern electric central station. His customers were few, their lives and interests simple, but he had to consider and to take account of their feelings, their reactions to his personality and to his business methods. He never knew he had a public relations problem, but he did have. And if he did not solve it, he could not win the mean shelter and scanty sustenance that to him meant success in business. As a human being among his kind, the seller of sticks worked out his public relations problem without thought of it as such; he merely acted and spoke according to his intelligence and to his disposition, and as his actions and words pleased or displeased his customers he prospered or he failed.

Open the Shutters

In essence, the public relations problems of the electric utility of today and of the faggot merchant of ancient times are the same. The only differences are in size; the utility is not one man, but many, and its customers are numbered in thousands, as against the few that were served by the village peddler of twigs and branches. But these differences in size do not change the nature of the problem. It is still a matter of human beings living and working with and among other human beings.

The most important part of the utility public relations job is to show people the company as it is, an organization of men and women who contribute their services and their dollars to an enterprise which performs a necessary service. The company is intensely human to the people who work for it and know what its payrolls and its conditions of employment mean to them. To the others, the company must consciously and continuously demonstrate its human-ness if it is not to be regarded as an impersonal thing wholly lacking the warm attributes of life.

Amicable relations with the public cannot be established and maintained by delegating to a man or to a department the job of informing the people and keeping them satisfied while all the rest of the company goes its way regardless.

The public relations representatives of the company must be all its employees and security holders. These groups are responsible for the measure of good or ill will that any company accumulates over the years of its business history. The *esprit de corps* of the organization—the mental attitude of the men and women who are the corporation to every one else in the community—must be built high. They must believe themselves a

living and vital part of the business. To succeed in this effort, the poorly fitted must be properly adjusted, the misfits must be fitted as much as possible, and the unfits eliminated. Scientific leadership, vocational education, apprenticeship and supervisory process training are essential to secure lower labor turnover, accident reduction, decreased operating cost, and elimination of waste.

Understanding Makes Interest

Inform the workers and tell them why. Discuss problems patiently and systematically with employees in terms they understand. Management has often complained of the lack of interest on the part of workers. This complaint has been registered without cognizance of the fact that it is impossible for workers to co-operate unless they have an intelligent and comprehensive understanding of the whole problem. The employee is the key to better customer relationship. The attention of employees to their work is shown best by their willingness and eagerness to serve their fellow men.

When we compare the large and diversified present-day utility business, which requires hundreds of employees, with that of as short a time as twenty years ago (when person-

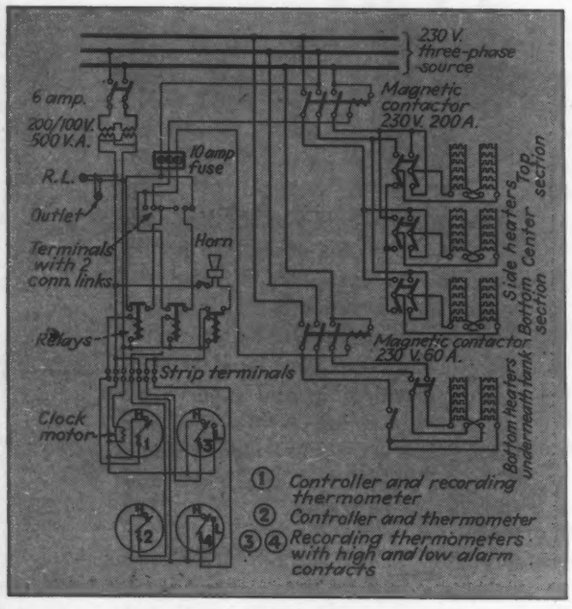
[*Continued on page 106*]

PUBLIC RELATIONS SERIES

Power Transformers Dried in Field by Vacuum

Deficiencies of impedance and hot air methods previously used in field led to the construction of portable vacuum equipment — Up to nineteen gallons of water taken from an 18,500-kva. transformer

J. C. GAYLORD, Hydro Engineer, Southern California Edison Co., Ltd., Los Angeles



WIRING for heaters and control

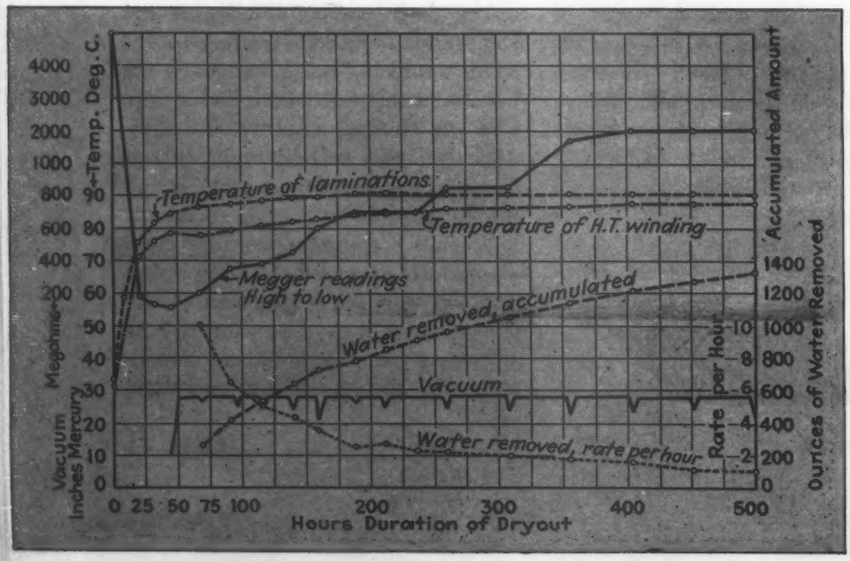
Heaters on the side of the tank are controlled by a contact-making thermometer with its bulb located in the top of the tank above the transformer being dried, and those under the tank are controlled by another thermometer with its bulb under the transformer.

UNTIL RECENTLY, whenever it has been necessary to dry large transformers in the field, Southern California Edison Company has used either the hot-air or impedance methods. Whenever it has been feasible to move transformers to the test department they have been dried by vacuum process. The more satisfactory results obtained by the vacuum process, together with the difficulties of setting up for either the hot-air or the impedance process and of determining when transformers are dry, plus the danger of fire with hot-air drying, led us to consider using the vacuum process for field jobs. In two cases, one at Eagle Rock substation* and one at Big Creek power plant No. 2, special set-ups were made and the transformers were dried in their own tanks by vacuum. While the results in these two cases were satisfactory, the air compressors used as vacuum pumps and other pieces of equipment were more or less makeshift. The transformer tanks were not designed for internal vacuum and had to be reinforced, and it was rather difficult to keep the tanks tight and hold a satisfactory vacuum.

Soon after these two transformers were dried definite indications of moisture were found in seven other large transformers of the shell type at one of the Big Creek plants. These transformers are 18,500 kva. capacity, 11 kv. to 127 kv., and are connected in two three-phase banks with one for spare. They were installed in 1923 and when installed were dried by the hot-air method.

Faced with the necessity of drying these seven transformers, and with an eye to 47 other large units located in the other three power houses at

* See article by Kyle M. Stevens, test dept., Southern California Edison Company, Ltd., *Electric Journal*, July, 1937, page 277.



PERFORMANCE of portable vacuum drier

As is shown by the curves, water is extracted very rapidly during the first part of the process. The rate decreases gradually and becomes nearly constant at the end of the run. Megger readings decrease rapidly as the temperature rises, and then begin gradually to increase and become nearly constant as the transformer dries. Controlling temperatures are kept as near 90 deg. C. as possible throughout the run. This is well above the boiling point of water under the existing vacuum. The vacuum is held continuously as high as possible. However, the leakage distance over the porcelain on the inside ends of the spark plugs is so short that it is necessary slightly to lower the vacuum when megger readings are taken.

Big Creek, we decided to build a vacuum tank and provide the necessary accessories, thus making a complete equipment for drying large transformers in the field. This tank was completed in the latter part of 1938.

The Process

The winding and core assembly of the transformer to be dried is placed in the vacuum tank. The tank is closed and all piping and electrical connections for heating and control, and for temperature, resistance and megger readings, are made up. Before any heat or vacuum is applied readings of all temperature-indicating devices, megger readings of the windings, resistance of the high-voltage winding, etc., are taken.

As soon as these readings are completed full heat, approximately 62.1 kw., is applied for two hours. For about the next eighteen hours the heat is reduced by connecting the heaters on the three top sections in star on three-phase, 230 volts. The heaters under the tank are left on full. This reduces the input to approximately 28.6 kw.

When the average temperature of the high-voltage winding, as calculated by the resistance method, has reached 70 to 75 deg. C. the vacuum pump is started and the heat is reduced to about 15.8 kw. by connecting the two groups under the tank in series. This connection of heaters is continued through the rest of the process. About ten hours is used to bring the vacuum up gradually to a maximum of 28 in. Hg. This is within less than ½ in. of the maximum possible vacuum at the altitude (El. 1,424 ft. above sea level) of the plant.

For the transformers being dried at Big Creek the process is continued until the megger readings become constant for a period of 48 hours or more, until the water rate is reduced to 1 oz. per hour or less, and the resistance of the high-tension winding becomes constant. So long as moisture is being evaporated adjacent to the copper of this winding, that water absorbs heat and tends to keep the temperature of the winding down. When all the moisture has been evaporated the temperature of the winding will approach 90 deg. C. and will become practically constant.

As soon as these conditions have been satisfied the tank is filled with

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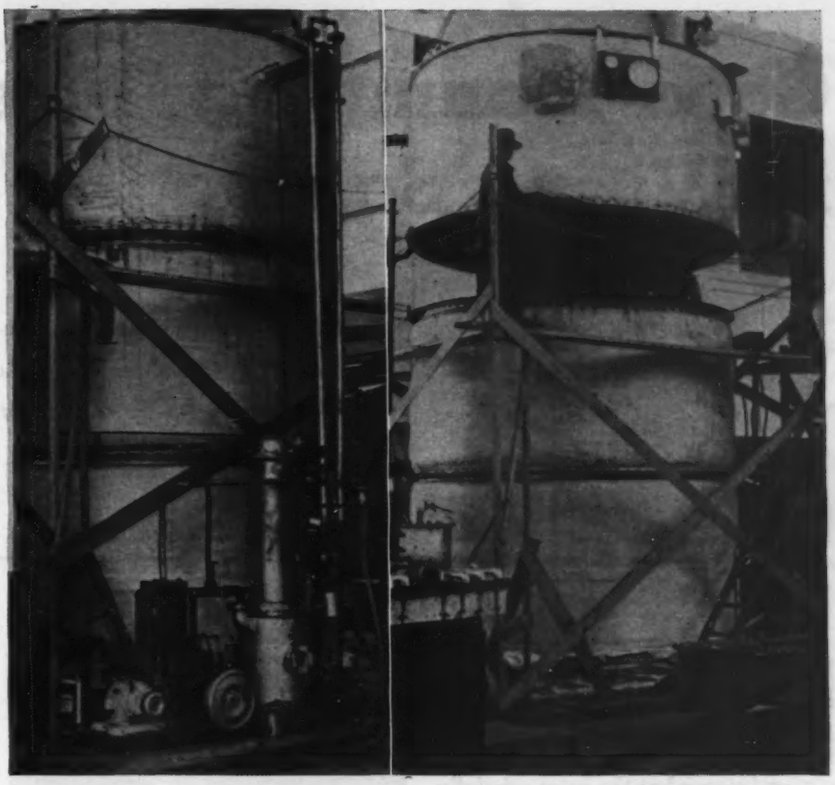
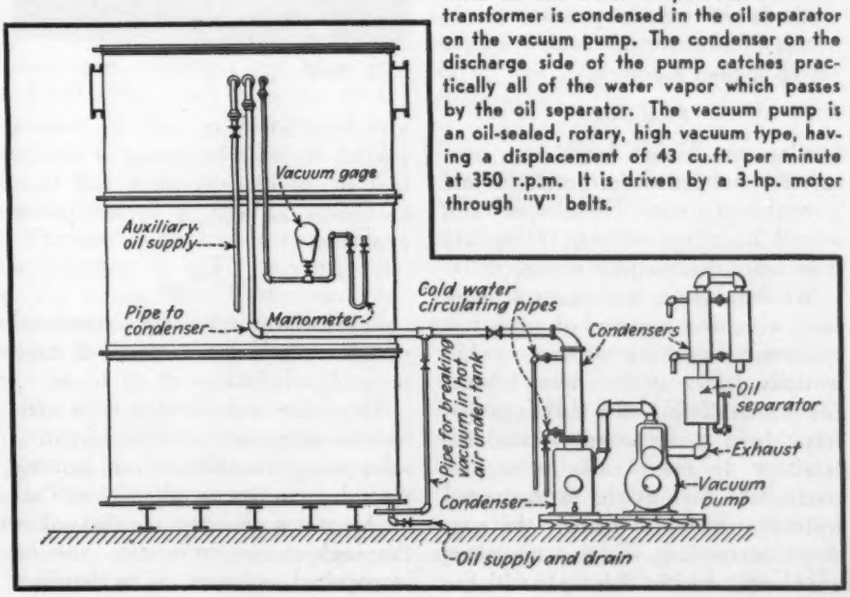


VACUUM TANK with condensers and vacuum pump and with top lifted

The tank is cylindrical, 10 ft. 6 in. inside diameter, by 15 ft. high inside. The bottom is ⅜-in. steel plate, reinforced with I-beams to carry the weight of the transformer and to stiffen it against external atmospheric pressure. The sides are ⅜-in. plate reinforced with angles, and the top is 7/16-in. plate bumped to a spherical surface with the convex side toward the inside of the tank. The tank is of welded construction in three sections for portability.

In the top section are two manholes, one with a heavy glass window for observation. There are also fourteen tapped holes in the top section, into which ordinary automobile spark plugs are screwed, through which to bring out leads for temperature and resistance measurement. Uniformly spaced around the sides of each section and under the bottom of the tank are 1,500-watt, 230-volt strip heaters with connections for various combinations of series and parallel groups. Outside the heaters, around the tank, is a layer of heat-insulating material two inches thick, held in place by poultry netting and covered with canvas. The top is insulated by a blanket of the same material laid over it. The bottom is insulated by the pocket of dead air under the tank.

The water-cooled condenser between the tank and the vacuum pump has 16 sq.ft. of condensing surface and, except at first when the vacuum is being slowly increased, is used largely to condense the transil oil vapor evaporated in the tank, thus preventing dilution of the pump lubricating oil. Most of the water evaporated from the transformer is condensed in the oil separator on the vacuum pump. The condenser on the discharge side of the pump catches practically all of the water vapor which passes by the oil separator. The vacuum pump is an oil-sealed, rotary, high vacuum type, having a displacement of 43 cu.ft. per minute at 350 r.p.m. It is driven by a 3-hp. motor through "V" belts.



Good Planning a "Must" in Wiring Sales

Crediting wiring installations on the point system has improved wiring in 2,000 homes ninefold — Accomplishment estimated at 35.6 per cent of standard — Each type of building treated as a special case

E. G. STAHL, Sales Manager San Joaquin Power Division, Pacific Gas & Electric Company, Fresno, Calif.

DOWN in the San Joaquin Valley we have discovered, at considerable expense to the company, that an attempt to sell or promote adequate wiring by any but the most carefully planned technique is a great waste of money. We have found that it is a waste of money to send a salesman —even a good salesman—into the field without support and without a well-organized sales plan, if we are attempting by pushing doorbells to sell more outlets and bigger copper.

Wiring sales promotion is a tough job. We have found it to be the toughest sales job we have. To be successful and to pay a return it must be based on definite knowledge of the field conditions, careful selection and training of contact men and proper supervision and support. Our survey has indicated that three different methods of wiring promotion are necessary to cover the field. We have set up a plan for each.

E. G. Stahl

Plan One

Plan one covers large new commercial and industrial buildings and government, state, municipal and school buildings as well. These are invariably designed by architects.

We employ an architectural engineer, who, over a period of years, has rendered consulting service, or has actually drawn up the wiring layouts for practically all such buildings that have been constructed within the territory. In many cases, after preparing the layouts, he is requested by the architect to inspect the construction work to see that the plans are complied with. This tie-in with the architects has been built up over a period of years by giving a service that is valuable to them and their customers as well as to the power company.

Plan Two

Plan two covers small commercial establishments and remodeled commercial installations of all types.

This plan was developed in connection with our commercial-lighting sales plan. In order to sell lighting the salesman has to sell wiring. Part of his sales training consists of a thorough course in wiring, and he is required not only to be familiar with wiring materials and costs but also to be able to lay out, on paper, wiring plans and specifications for all types of installations that come within the scope of his sales activity.

At first we required salesmen to prepare their own layouts, but we soon discovered they were spending three-fourths of their time in the drafting room, so we employed draftsmen, who, with instructions from salesmen on technical details, could do the layout faster and better.

Through this plan the commercial-lighting salesman can give his prospect a well-drawn wiring layout. And he can be sure that in a high percentage of cases the job will be installed as planned.

These men sell no equipment. To complete their sale requires the cooperation of the fixture dealer and the wiring contractor, and we have found that one of the best sales helps in securing the desired installation is the layout service.

We have had fine co-operation from our electrical inspectors, and it is my experience that they have played a major rôle in advising customers of the necessity for adequate wiring installations.

Plan Three

Plan three was designed to cover the domestic field. Maybe I should say scratch the domestic field, because I believe that neither my company nor any other is achieving complete coverage of the domestic field in wiring sales promotion.

In this plan our activities are at present concentrated on new or re-

modeled homes and, for the past two years, the rate of building has been sufficient to occupy the full time of our field force.

There may be some criticism of our neglecting old homes, but our survey has indicated that raising the standard of installations in new homes creates a demand for remodeling or improving the older ones. As new homes are built and occupied in outlying districts there is a definite trend in older residential areas near the center of town toward converting to commercial establishments or apartment houses, or remodeling, and when this is done, of course, a good opportunity is available for selling an adequate wiring job.

Trained Salesmen

As in the case of commercial wiring promotion, the selection and training of salesmen is extremely important. They must have a thorough knowledge of wiring methods and materials, they must know the standard requirements and be able to recognize compliance or non-compliance on the job. They must be able to sell the idea of investment in copper, outlets and switches. They must accomplish this with a customer who generally has no technical knowledge and whose finances have already been stretched beyond the elastic limit.

Only 3 per cent of the homes are designed by outside architects. Ninety-seven per cent are designed by contractors, building material supply company representatives and by the owners themselves. Wherever possible, our salesmen secure the plans of the building and have a standard wiring layout drawn in. This alone doesn't cinch the job, but it is a big help.

Wiring Credits to Salesmen

Division	Quota Points for Compliance With Standards
1. Main service	5
2. Switches	4
3. Convenience outlets	4
4. Lighting outlets	4
5. Range circuit	4
6. Water heater circuit	4
7. Air conditioning circuit	2
8. Radio wiring	1
9. Distribution panel	2
Total	30

Extent of electrification is measured in points, according to the class of home. The home is classed according to its value: Class A, $7,001 or more; Class B, $5,001 to $7,000; Class C, $3,001 to $5,000; Class D, $3,000 or less. One point is rated at $1.50 per year in revenue.

DOMESTIC CERTIFIED ELECTRIC PLAN
SUPPORTING ADVERTISING in San Joaquin Valley papers
ARE YOU GETTING BY WITH MAKESHIFTS?
"Be wise and modernize in 1939"
If one poor little light cord is trying to do the work of three, the chances are you're not getting the results you want.
And the chances are that the remedy is just a little additional wiring and more convenience outlets. Now is the time to check up on your circuits.
—In fact, it's always well to remember the five essentials of the modern home:
1. Adequate Wiring
2. Correct Lighting
3. Modern Kitchen
4. Automatic Hot Water
5. All-Year Air Conditioning
PACIFIC GAS AND ELECTRIC COMPANY

AVERAGE ACCOMPLISHMENT of 35.6 per cent of wiring standard is reported by San Joaquin on basis of compliance points listed on plan sheet

Our domestic wiring standards are based on Red Seal specifications. In order to allow sales credit where credit is due, we have broken the requirements down into nine divisions, as shown in the accompanying table.

Each of these divisions is assigned a value in accordance with its relative importance and on each job the salesman gets credit for each division that complies with specifications. If, for example, on a particular job, all divisions comply with the specifications, he is credited with 30 points and a Red Seal job. If, on the other hand, all divisions comply except the main service, he would not get credit for a Red Seal job, but he would get 25 points.

This system, we believe, encourages the salesman to build up every job as far as possible, rather than to spend effort on only those jobs on which he can secure a Red Seal certificate.

The real accomplishment has been in increasing the wiring on some 2,000 homes from an average of less than four points per home, as determined by extensive surveys on jobs where no sales effort was applied, to 10.69 points per home on jobs that the salesmen have worked. This is an average accomplishment of 35.6 per cent of standard requirements, and it is my opinion that if the average was much higher than this amount it would be desirable to raise the standards.

One of the biggest obstacles in getting standard wiring jobs is to secure separation of the appliance and the lighting circuits in remote bedrooms. This one feature alone, insignificant as it may seem, has reduced the number of Red Seal jobs by more than 50 per cent.

$1.50 Per Point

In addition to wiring promotion, our salesmen are promoting complete utility service in the home, including wiring, lighting, kitchen equipment, water heating and inside weather control.

They work toward specified standards for each of these five major features, and when 100 per cent compliance is secured they receive 100 points, 30 being for wiring. Careful investigation has indicated that the average annual revenue approximates $1.50 per point.

[*Continued on page 111*]

Editorials

S. B. WILLIAMS, *Editor*

Two Sides to Integration

HEARINGS on integration under the Holding Company Act have been scheduled to begin in another month. Just what course the SEC will take with respect to the disposition of operating property is not known. Probably the commission itself does not know, preferring to let the facts brought out in the hearings indicate the desirable disposition.

Through public statements of its chairman, however, the commission has indicated that it will not act hastily or punitively. It has an act to enforce and will try to do so with the minimum amount of dislocation.

There are two sides to this problem which must be remembered in every consideration thereof—financial simplification and physical integration. The simpler of the two is probably the financial. It means the removal of many allied and subsidiary companies which for the most part have outgrown any especial reason for continuance as entities.

When we come to integration of the physical properties, the operating units, we are faced with a much more difficult problem because of the effect upon service and upon employees. A high degree of efficiency has been developed by the operating companies. No small part of that efficiency, as well as quality of service, has resulted from the character of the system in which the companies now operate. To remove a company from one system or continue it with others will not always be advantageous.

Mere size of operation is no criterion of efficiency. Some of the smaller properties, because of the character of the load and its location with respect to source of supply, can be operated more efficiently than some larger properties with a less desirable load configuration.

There are also situations where a property does not enjoy the confidence of its community. To tie it to another company with just the opposite situation might, given sufficient time, be to the advantage of the former community, but in many cases would be immediately harmful to the better company.

The matter of rates must be taken into consideration. Integration almost of necessity means equalization of rates of integrated properties—and equalization in this instance always means down to the lowest.

Finally, there is the matter of employees. We have always pitied the Acadians. We are now sympathizing with those Finns who have through another kind of integration lost their homes. There is something of the same thing here. To rearrange men's employment through integration means different management, different rules, different opportunities, different pathways of progress, a tearing away from that which was not only familiar but which many of the people had had a hand in developing.

Since electric service is still so much the reflection of the quality of the individual and the co-ordination of his operations with his fellows it would seem that considerable attention might be given to this factor in arriving at a decision.

This whole question of integration must be approached with the utmost care and understanding. It must not be just a reshuffling. That would be disastrous for everybody, including the public. It must be done in a manner that in the long run will insure the earning power of the properties and give management a reasonable incentive to grow as well as to bring to the consumers as good or better service at the same or lower rates.

Controlling Turbo-Alternator Noise

TURBO-ALTERNATORS are occasionally making themselves heard, particularly since they went to bipolar form and 3,600 r.p.m. hand in hand with the high-pressure steam that calls for high speed and permits small dimensions. Magnetic distortion of the stator of these units is likely to be much greater than with the familiar four-pole, 1,800-r.p.m. units. The 7,200-cycle vibration in some instances has been objectionable, but even then not so much so as the noise from reducing valves which throttle down the steam pressure to rest-of-plant level when a superposed unit is not operating. The alternator vibration has in instances destroyed neutral disconnect bearings, caused false action of relays and meters and interfered with interchange of operating messages.

Both these sources of noise and vibration deserve attention. It is known that alternator manufacturers are working to reduce or absorb the vibrations which originate in the rigid stator core and are communicated to the somewhat less rigid stator frame. Thence they are transmitted to foundation, and in some instances it appears that bedrock is the medium by which the building structure acquires the propagated vibration.

Research will undoubtedly develop a fully cushioned or absorbent stator, but in the meantime there are palliatives that can be applied to those machines which prove to be bad actors. The supporting structure can be made more massive and rigid. Vibration joints can be introduced between turbine support and the building floor slabs and structure. Natural frequencies of vibration of associated equipment can be chosen to be off the resonant point. Another thing that can be done is to mount on vibration insulators the switchboards and control boards, starting cubicles for feed-pump motors and other equip-

ment prone to vibrate. As a last resort sound-proof or sound-shielding inclosures can be erected around communication and control centers so that efficiency of operating personnel can be sustained at high level.

Certain studies have shown that, in addition to pressure-regulating valves, the process of soot blowing, the feed pumps and the turbines driving them can cause even more noise than 3,600-r.p.m. turbo-generators. So there is plenty of opportunity for acoustic engineers to help the power industry to cash in quietly on the economic advantage of high-pressure, high-speed generating equipment installed before development had fully taken cognizance of its noise-making potentiality.

Flatiron Fires Due for Reduction

APPROVED non-automatic flatirons will be available for still another year. Originally listing by Underwriters' Laboratories was to cease on May 1 this year. The date has been put off for one more year in order to permit "orderly readjustment of stocks and manufacturing methods."

Electric flatirons have been the cause of a great many fires, due to forgetfulness or carelessness on the part of the user. The automatic iron was developed to reduce this hazard.

Unfortunately refusal to list by Underwriters' Laboratories is not going to prevent the marketing of non-automatic irons. The utility industry, on the other hand, can by education and promotion hasten its disuse. The old-fashioned sad iron succumbed to the trade-in offers of a quarter of a century ago and the non-automatic iron can go the same way.

Fires from flatirons or any other electrical equipment are a distinct deterrent to use. The utilities therefore have a stake in the automatic iron, both from the viewpoint of energy sales and of improved public relations.

Keep the New Wires for Old Work

IN SOME PLACES inspection authorities are permitting the use of thinner insulations and greater conduit fill in advance of effective date of the new National Electrical Code. It is perhaps just as well that it happens this way because it gives manufacturers and distributors the opportunity to produce and stock the new wires in an orderly manner.

By restricting some of the new wires and diameters as well as larger conduit fill to rewiring the code makers have done both the industry and the public a real service, although some doubt exists as to its legal enforceability. If there are any who look upon this as an entering wedge that will enable them sooner or later to get the same regulation for both new and old work they should stop to examine the consequences.

The new rules permit much greater conduit capacity in terms of copper for rewiring than for new work. This gives to the prospective building owner an insurance against premature obsolescence due to inadequate wiring. It also gives him the benefit of less expensive wiring during the years when energy requirements are growing. If contractors were permitted to use the greater conduit fill or greater wire capacity the owner would have no leeway when his conductors became loaded. Likewise, the utilities would find that using the permissible old work values for new work would definitely limit for life the use that building could make of electricity.

Unquestionably the rules as adopted with differences between old and new work are a compromise, but, unlike so many other compromises, this one represents the very best thing that could happen for the public, the contractor, the journeyman, the manufacturer and the utility. It is sincerely urged that no one be shortsighted enough to urge the adoption of rewiring quantities for new work.

Economics of Power-Factor Correction

WHAT might be called the building margin of reserve on utility systems has been gradually absorbed by a steady load growth and renewed interest is had in getting full utilization of all system equipment and lines. In large measure this requires a study of power-factor conditions and the use of corrective equipment or rate schedules requiring or inducing power-factor correction.

In this connection some fundamental considerations may be helpful. One is that system costs are not directly proportional to kva. because kw. demand and kva. demand have vector relationships. Another is that power-factor conditions are significant only at the time of peaks. A residential feeder, for instance, may have a power factor of 60 in daytime, but at night, when the peak is on, the power factor may be 95. Another fundamental is that high power factor may not be entirely beneficial in an extended transmission system because it makes for instability in operation when faults occur. Synchronizing power is had only with lagging currents.

An approach to getting more capacity out of a system by using power-factor rate schedules or kva. demand metering should be based upon a careful consideration of the engineering fundamentals. An inducement to customers to correct power factor by permitting them to get a return on their investment out of proportion to the benefits derived by the utility hardly seems practical. Likewise, the practice of using average power factor as a measuring stick, even though this is a somewhat meaningless term.

Power-factor correction at the time of annual peak loading in any part of the system can increase the earning capacity of the system, but this project is one with many variables that need consideration before action is taken to correct power factor.

Another PWA Threat

By CARTER FIELD

This noted journalist gives his personal comments and interpretations on current happenings affecting the electrical industry. His background and his location at Washington make his thoughts informative and interesting even though all may not agree with him

NOTICE the hearings on the Mead bill? That's the bill introduced by Senator James M. Mead of New York providing for $300,000,000 in loans to local governments for hospitals, sewers, schools, etc.

It sounds fairly innocuous, so far as government competition with private capital is concerned. But don't take it for granted that this threat has been lifted, even until after election. The Mead bill is not what the New Dealers want. Not by a jugfull. They want the bill introduced by Senator Charles O. Andrews of Florida. And the Andrews bill is calculated to cause sleepless nights to any one with his savings or inheritance invested in private utility securities. Or, for that matter, to any one at all concerned about the future of this country if government spending and taxation continue at the present rate.

Let's look at it a moment. But before plunging into details let it be said that this bill was introduced by the Florida senator after most careful study. The study was by John M. Carmody, Commissioner of the Public Works Administration, and his assistants. The bill was then written in Carmody's office, and introduced without the dotting of an "i," so far as the Carmody lieutenants could detect, by Senator Andrews.

Need It to Win

Every left winger in the New Deal is for it. The President has not given the green light yet, but the left wingers boast that he has given it a "favorable eye." And they predict positively that it will become law before the adjournment of the present Congress, unless business picks up in the meantime. It will be a necessity, they say, not only to prevent undue suffering by the underprivileged, but to win the November election.

Now for the details of this proposed legislation. It sets up a revolving fund of $300,000,000—same amount as the Mead bill. But the Mead bill does not "revolve," and furthermore it is sharply limited.

The Andrews bill is virtually the old "spend-lend" bill which Congress scorned, save that, the New Dealers say, the "bugs" have been removed. It would work like this: The Commissioner of PWA would decide on loans to public or private non-profit organizations. He would be guided only by the legislative advice that the purpose in each case—that is, the purpose from the federal government's viewpoint—should be to provide employment.

Guarantee Local Bonds

What he would do would be to buy bonds of the local government or non-profit organization. Then he would be at liberty to sell those bonds immediately to the public.

But why not let the local governments or non-profit organizations sell their bonds direct to the investing public, one might ask.

That's simple. Before passing the bonds on to the public Mr. Carmody's PWA would stamp each of them with the federal guarantee *both as to principal and interest!*

The moment the bonds, thus guaranteed, should be sold the PWA could then loan the money to other local governments and non-profit organizations, with *no limit whatever* on the total liability which the revolving operation might thus place on the federal credit!

Senator Andrews estimates that a billion dollars a year could thus be expended, or three-and-one-third revolutions every twelve months for the $300,000,000 fund.

Nor is this all. It is proposed that the government make a small, very small, profit on the interest rate, as a sort of insurance premium against default by local governments or non-profit organizations. But this profit is not to be large enough to pay the federal government's costs in conducting this investment banking business. That cost is to come, of course, out of the federal Treasury and have no connection whatever with the $300,000,000 revolving fund.

Also, it is proposed that the federal government supply the local governments and non-profit organizations with engineering and other technical aid free. There is nothing new about this, of course. That sort of thing permeated the loan and grant policy under which Harold Ickes' PWA subsidized public ownership electric developments.

But the notion that one man, the PWA Commissioner, can issue an unlimited amount of federally guaranteed bonds for any sort of project he thinks would provide employment, provided only that his sales of these bonds to investors shall be made promptly enough to keep within $300,000,000 of his loans, is the very sort of thing that shocked Congress into revolt against the original spend-lend bill.

Will It Go Down?

Will Congress gag again? That's a question worth studying. Don't forget the pressure that will be rolled up for this bill, if and when the President gives the green light. It will not only be Administration pressure. That would not be enough. But there will be very few states in which contractors, scenting new business, will not be putting the screws on their senators and representatives to pass the Andrews bill, and pass it without crippling amendments.

What are crippling amendments? For instance, one that will forbid any loan which would set up competition with private business unless the local government had made a fair offer to purchase the private business. And everybody knows how that works.

But we can't see people suffer. And of course it would never do for the Administration to lose this election!

NEWS OF THE WEEK

Kansas City Modernizes Northeast Steam Plant

New ventilating system installed to eliminate water and fire hazard — Rebuilds breakers and increases capacity — New 50,000-kva. turbo-generator to replace unit of smaller rating

Modernizing the Northeast station of Kansas City Power & Light Co. has presented many interesting problems. When the new 50,000-kva. turbo-generator is installed, replacing a 27,500-kva. unit, the station will be one of the most efficient in the country.

Back in 1938, President Chester C. Smith says, the company had experienced some serious trouble on the generator bus from water coming in around the window frames during a severe storm which blew the water in between the frames and the building, as the frames were warped by the wind pressure. Subsequent inspection and study of the window frames indicated that in another similar storm, water could not be kept out. To meet this situation the company decided to close up all openings into the switchhouse and install a complete ventilating system.

Chester C. Smith, president of Kansas City Power & Light.

Eliminate Hazards

Mr. Smith said that the ventilating system eliminated the water hazard and, at the same time, by using washed air, eliminated the "dust" problem. The system makes it possible to remove smoke and fumes in case of a flashover or bus fire and, as added protection, the various sections of the switchhouse have been isolated by the installation of fire walls and walls around the stairs to prevent the gas and smoke from going from one floor to another.

The trouble experienced in the switchhouse in 1938, due to water getting in, made it evident to the company that the switching equipment, a large portion of which was installed in 1919 and 1920, should be remodeled.

The twenty-one type H-6, 15,000-volt breakers used on generators and for sectionalizing the bus and transferring from one bus to the other were rebuilt to type H-26, increasing the capacity to 2,000 amp. and interrupting capacity from 500,000 to 1,000,000 kva. During 1940 the company expects to protect further the main 13,200-volt bus by installing a differential protection on the various sections.

As a further step in the modernization of the Northeast switch-house, Mr. Smith said, seventy type H-3, 500 amp., 15,000-volt G.E. circuit breakers, used on the outgoing feeders, are being rebuilt to type H-103, making some oil-tight and reducing the fire hazard. This work was started in 1939 and will be completed this year.

The 550-volt house service bus consisting of 98 G.E. circuit breakers (K-12, K-132 and K-134) are being replaced with Westinghouse type DA air circuit breakers with capacities of from 400 to 2,000 amp. and interrupting capacities from 40,000 to 60,000 amp. The original house service equipment was 550 volts, but subsequent house service equipment, particularly the large units, are served off a 2,300-volt bus which is supplied from two 4,000-kva. transformers, and plans have been made to install differential protection on this bus during the coming year.

Mr. Smith said that the original 550-volt bus was supplied by five 1,800-kva. oil-filled water-cooled transformers which are being replaced by four 2,000-kva. Pyranol-filled transformers.

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Correction

"Electrical World" sincerely regrets the error in the March 16, 1940, issue in publishing the picture of Cedric G. Smith, manager of credit and collections, appliance and merchandising division of General Electric Co., for that of Chester C. Smith, president of Kansas City Power & Light Co.

Reports TVA Tax Bill

A bill to allocate 10 per cent of revenues of TVA to compensate states for loss of taxes on lands taken under federal jurisdiction in its operations received a unanimously favorable report from the Senate agriculture committee. The bill was sponsored by Senator Norris. It would graduate proposed compensatory payments to states downward from 10 per cent to 5 per cent over a period of five years.

GOVERNMENT TAX TAKE—Chairman Floyd L. Carlisle of New York's Consolidated Edison showing stockholders at their annual meeting this week how the increase in taxes is taking a greater share of revenues each year, leaving less for investors

United Illuminating to Spend $5,500,000

Stockholders of the United Illuminating Co. were informed at their annual meeting last week by President James W. Hook that the company has planned to spend $5,500,000 during the current year and 1941 for improvements and additions. Comprehensive survey of the system's needs had been made by Gibbs & Hill and Westcott & Mapes and recommendations made for reinforcement of the facilities and the appropriation was founded on their advices.

Among the improvements authorized by the directors are a 25,000-kw. generator for the Steel Point plant at Bridgeport, Conn., and a new 13.8-kv. bus for the station. There is also to be a 66-kv. two-circuit tie between the Bridgeport and New Haven plants, hitherto without interconnection. This is intended to minimize the requisite reserve capacity otherwise carried in the separate plants and to afford better basis for interconnection with other companies in case of emergency.

Additional boiler capacity will be installed in the New Haven generating station to match the installed generating capacity.

Mr. Hook informed the stockholders that the entire expenditure can be financed out of funds available in the company's investment account. The new facilities are to be ready to handle the fall peak of 1941.

It was reported that 1939 net totaled $3,609,145.67, a slight increase over 1938. Four per cent bonds totaling $1,625,000 issued in 1900 matured on February 1 and all but $79,000 has been presented for payment. Taxes paid in 1939 were $1,522,000 ($110,000 more than in 1938) and amounted to 15.5 per cent of operating revenues. The taxes exceeded payrolls by $65,000 despite the increase of $75,000 on payrolls over 1938. Dividends were paid to the amount of $3,427,127. Company plant and equipment are valued at $33,902,763.71.

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Union Electric Official Indicted by Grand Jury

A federal grand jury has returned an indictment of Frank J. Boehm, former executive vice-president of Union Electric Co., on charges of perjury in connection with testimony given before an examiner for the SEC, which is investigating the political and business activities of the utility and its subsidiaries.

The grand jury also reindicted Albert C. Laun, former vice-president, on perjury.

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Seeks Commission Post

Gordon Persons, candidate for president of the Alabama Public Service Commission, has announced a fifteen-plank platform, advocating "lower electric rates—based on TVA yardstick." Mr. Persons is opposing the veteran Hugh White, commission president since 1927, in the May 7 Democratic primary.

Stockholders Praise Utility Management

The annual meeting of Consolidated Edison Co. of New York this week turned into a love feast, with stockholders voicing approval of the management and its operations in lavish tones. More than five hundred stockholders were present to receive the report of Chairman Floyd L. Carlisle, who reported higher gross and net earnings, as well as increased corporation taxes.

Mr. Carlisle said that the taxes have doubled since 1929 and it is inconceivable that there could be a further increase. However, he said, if government does not reduce expenditures, then taxes will go higher. "This company is taxed more in proportion to its sales than any other in the United States." He declared that if the company was taxed on the basis of Chicago it would save $17,000,000 annually. Taxes totaled $54,320,798 for 1939.

Returns from a questionnaire sent to all stockholders revealed that 94.4 per cent favored allowing the board of trustees to use its own discretion in determining the method to be employed in future financing by sale of bonds or debentures by the company. Stockholders were not in favor of competitive bidding in the sale of bonds. Mr. Carlisle said the company needs no new financing this year.

Mr. Carlisle expressed the hope that the stockholders were taking and had taken advantage of the appliance sales campaigns conducted by the company. He said that the company was adding 130,000 kw. to its capacity and he expected no power shortage in the future.

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Voters Reject Plan for City-Owned Plant

Voters of Harrison, Ark., have voted overwhelmingly to reject a proposal by the city administration to obtain an appraisal by the Arkansas Utilities Commission of the Arkansas Power & Light Co.'s local properties with a view to the city taking them over and operating them. The vote was 713 to 251. The action of the voters stops in its inception the move to acquire the properties.

The City Council recently authorized sale of 5 per cent bonds for the proposed municipal plant, depending on the outcome of the special election. The E. P. Archer Engineering Co. of Kansas City had obtained a contract to build the plant conditional on favorable action on the municipal program.

E.E.I. Sales Conference Seeks Way to Aid Load

President Kellogg says major problem of utilities is to retain properties —"Faster in Forty" is theme in appliance drives — Industry out to produce profitable sales

The number one problem of the public utility industry today, C. W. Kellogg, president of Edison Electric Institute, stated Wednesday in Chicago, is to hold on to the properties against the forces that would try to take them from the present owners. "Nothing will help more effectively to solve that problem than the greatest energy, the most skillful ingenuity, the most endless persistence in sales effort," Mr. Kellogg told approximately 600 utility sales executives assembled at the Edgewater Beach Hotel for the seventh annual sales conference of the Edison Electric Institute.

Seventy-five million dollars per year are spent by utility companies for sales and promotional work, Mr. Kellogg told his hearers, and manufacturers of electrical apparatus, he said, through their constant improvement of new appliances and steady reductions in prices, have been able and effective allies.

"Faster in Forty"

"Faster in Forty" is the theme this year, H. E. Dexter, vice-president of Central Hudson Gas & Electric, and chairman of the E.E.I. sales committee, stated in officially opening the sales conference. The sales plan which is successful, he said, is the plan which yields the greatest contribution to the net figure in the income statement. "Mere volume of sales does not deserve the name of sales plan."

Mr. Dexter pointed out that a utility plan should be designated (1) to produce more profitable sales per dollar of sales expense, (2) to insure more complete coverage of the market, (3) to balance properly industrial, residential and commercial sales and (4) to improve saturation on present existing plant facilities now available but not fully employed.

Following two days of committee meetings, the Modern Kitchen Bureau, with Chairman Walter H. Sammis presiding, started the series of open meetings with its Tuesday morning session, evidencing mounting interest in range promotion for 1940. W. A. Grove reported 135 utilities, or 29 per cent more than last year, had ordered 346,000 pieces of promotional material. Large corresponding increases in utility orders for 1940 water heater material were announced by A. H. Jaeger. Roger Bolin made the MKB refrigerator program presentation and, in view of renewed utility interest in larger refrigerator volume, stressed the 1940 accent on electric refrigeration copy in addition to the conventional brand and special feature individual advertising. C. J. Coward outlined 1940 roaster plans.

Dr. G. W. Allison, E.E.I., exhorted utilities to supply the localized sales force necessary to move a billion dollars worth of electrical appliances per year.

R. E. Fisher, vice-president Pacific Gas & Electric Co., reminded his audience that service to the customer is the test by which the usefulness of any business must be measured, and in 1940, Mr. Fisher said, there are greater specific opportunities than ever before to serve industrial customers and build business on a mutually satisfactory basis.

A successful attack on range installation costs which resulted in a reduction of 40 per cent in ten years was described by Samuel Stites, division manager Ohio Edison Co., Youngstown. For details of the "Youngstown Plan" see ELECTRICAL WORLD July 22, 1939, page 22.

Sales Program

Under the slogan "Mutual Opportunity Program," Mrs. B. E. Marsh, residential sales manager Nebraska Power Co., outlined a 76-day revenue recovery program set in motion by a $254,000 rate reduction. The campaign resulted in one sale per 2.7 calls. Mrs. Marsh announced the sale in 90 days of 312,000 lamps, 8,476 adaptors, 8,899 I.E.S. lamps and 8,783 wall lamps.

Sears-Roebuck Vice-President T. V. Houser, speaking from experience with millions of farm customers, reminded his hearers that no detail of selling technique can substitute for knowledge of the farm customer, knowledge of his problems and "complete familiarity with your own line of merchandise."

SALES MEETING—Seen in Chicago this week at the E.E.I. annual sales conference. L. to r.—Paul Manchester, Blackstone Valley Gas & Electric; Harris E. Dexter and Marshall N. Waterman, Central Hudson Gas & Electric, and Sidney S. Bradford, Potomac Edison; Henry J. Morton, E.E.I.; Harry Restofski, West Penn Power, and R. C. Wenz, Duquesne Light

New Projects Planned by Philadelphia Electric

Company to spend $15,301,000 on new construction this year, against $6,941,000 during 1939 — New 50,000-kw. unit to go in Chester station — Many studies are in progress

The Philadelphia Electric Co. system plans construction expenditures of $15,301,000 this year, as compared with $6,941,000 during 1939. In addition the system will spend for maintenance of electric facilities a total of $3,467,441, against $2,909,999 last year.

Allocation of total construction budget is as follows:

Electric	1939	1940
Steam stations	$1,965,000	$8,980,000
Hydro stations	10,000	100,000
Transmission	180,000	270,000
Distribution (incl. substations)	3,645,000	4,580,000
Common utility plant—applicable mainly to electric operations	450,000	485,000
Subtotal	$6,250,000	$14,415,000
Gas	575,000	770,000
Steam	116,000	116,000
Total	$6,941,000	$15,301,000

There were no major projects completed in 1939, but several were started during the year to be continued in 1940, Horace P. Liversidge, president, stated in discussing the company's operations. The projects started include the installation of a ring bus at Schuylkill steam-generating station and the addition of a 50,000-kw. turbo-generator superposed unit at the Chester steam-generating station to be completed in 1941.

Major Projects

Major projects contemplated to start during 1940, Edward Porter, vice-president, said, include the erection of a substation at Upper Darby, replacement of stokers at Delaware steam-generating station, installation of improved coal-handling equipment at Schuylkill steam-generating station, improvement of Westmoreland-Hunting Park tie line and additional street-lighting equipment for the city of Philadelphia.

During 1939 the system built 102.5 miles of rural lines and proposes to build 76.5 miles this year. Electric service is available in almost the entire rural area in the company's territory, it being estimated that 95 per cent of the rural population has service lines passing or within a very short distance from their doors. For this reason there is not much rural line construction to be undertaken.

The total volume of appliance sales last year was $2,955,716 and produced $309,240 E.A.R. It is estimated that sales will be $2,544,139 in 1940 and produce $289,604 E.A.R.

The average annual residential use was 959 kw.-hr. in 1938, which rose to 1,025 last year and is expected to hit 1,070 kw.-hr. in 1940.

Making Studies

Mr. Porter stated that the company, in connection with the provision of additional facilities for load growth and in review of operating experience, is making the following studies: Water conditions and treating equipment to minimize the formation of scale in high-pressure, high-temperature boilers.

Generating capacity additions in high, medium and low pressure units.

Switching plans for simplification and increased reliability of service in important electric distribution centers.

Application of oil-less and oil-poor circuit breakers to increase the reliability of facilities and reduce hazards to service.

Loading characteristics of equipment and lines in order to determine most effective operating ratings.

Review of lightning troubles on transmission and distribution lines and study of means of increasing reliability and improving service continuity.

LIGHTING—Strong direct intensity with diffused indirect light is used by M. H. Lamston, Inc., in its new 5-and-10 cent store at 45th Street and Lexington Avenue, in New York City. There are a total of 78 recessed units of 300 watts for direct lighting; sixteen 750-watt indirect hanging fixtures and 250 feet of Curtis Lighting Co. fluorescent lighting along the wall counters

Group Organized to Buy Puget Sound Utility

Incorporated as a non-profit co-operative organization by nine commissioners of public utility districts in the state of Washington, the Consumers' Non-Profit Public Power Corporation has been organized with the object of purchasing the state-wide holdings of Puget Sound Power & Light Co.

The organization proposes to issue bonds or by mortgage buy all property of the utility and resell or lease it to the individual public power dis-

Wins Nela Park Trip

H. T. Crane last year turned in the best performance of all Southern California Edison Co. commercial lighting engineers, thus winning a trip to the forthcoming advanced conference of utility lighting representatives at Nela Park. The award is an annual one to Edison lighting engineers and is known as the W. L. Frost award, in honor of Edison's retired vice-president. Last year's winner, D. H. Miller, Jr., will also make the trip this year.

Bangor Utility Shows Business Expansion

Healthy expansion of the business of the Bangor (Me.) Hydro-Electric Co. is reflected in figures just made public by President Edward M. Graham covering 1939 operations. The commercial department made gross appliance sales of $274,000, of which the major items were about 1,200 electric ranges, refrigerators and water heaters, with general employee participation in promotional work. Plant additions totaled $310,000. There were about 40 miles of rural line extensions completed, including a 15-mile line from East Machias to serve the town of Cutler. No new financing was necessary. About $300,000 will be expended in routine construction during 1940, including some 40 miles of rural extensions.

Mr. Graham stated that the expansion program at the Ellsworth and Veazie hydro-electric stations, completed in 1938, has provided a system capacity of about 165,000,000 kw.-hr. under average water conditions, which is about 30,000,000 kw.-hr. in excess of 1939 requirements. During 1939 larger conductors were substituted on the Ellsworth-Veazie transmission line to enable the new Ellsworth capacity to be delivered into the Penobscot River load area centering at Bangor when conditions require this. Engineering studies indicate system adequacy for normal growth through 1940-41.

Since 1935 the total annual domestic gross revenue has risen from $723,261 to $930,719, the number of customers has increased from 22,291 to 24,913, the average energy consumption per residence customer from 574 to 794 kw.-hr. and the average yearly gross per domestic customer from $32.45 to $37.36. The average rate per kilowatt-hour sold to homes has dropped from 5.65 to 4.71 cents. Gross income from the sale of electricity was the highest in the company's history.

•

Snow Pack in California Estimated at 75% Normal

"Fuel" for California's 1,682,000 kw. of hydro generators was laid down in abundance in late February storms, but mid-March reports of the California Co-operative Snow Surveys indicate the total snow pack is still below normal. Through March and April, operating engineers will watch weather closely, for conditions during that period will largely determine the spring run-off, hence the number of kilowatt-hours left stored in the mountains.

In general, the pack is 75 per cent of normal for this time of the year north of the American River and normal for the time on slopes south of there. The pack doubled in the last month, but is still deficient at lower altitudes.

Precipitation, on the other hand, is above normal, averaging about 130 per cent, but running up to 170 per cent in the Kern River.

•

Shawinigan Line to Be Put in Operation Soon

Erection of the main St. Lawrence River crossing towers of the Shawinigan Water & Power Co.'s transmission line to Sorel has been completed and the suspension of the steel messenger cables between these towers was finished early this month.

These towers are 375 ft. high and each contains 210 tons of steel. The distance between them is 3,950 ft. Erection of the towers was done in slightly less than one month.

Taking power from the company's Shawinigan Falls-Montreal lines, at 110,000 volts, the new line will feed the Sorel Steel Industries, Ltd., a total distance of 6 miles, and will be in operation on May 1.

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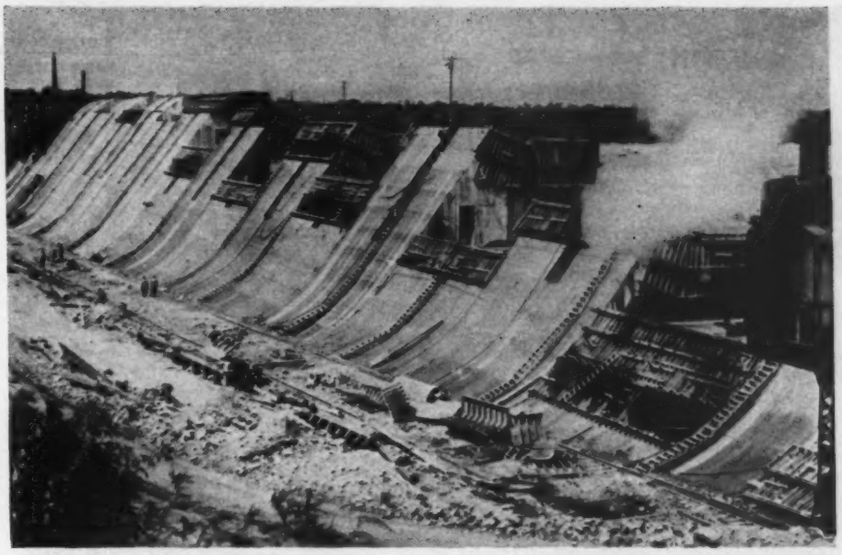
Approves Utility Purchase

The Wisconsin Public Service Commission has approved the proposed sale of the village of Middleton electric distribution lines to Madison Gas & Electric for $50,000 on the ground that the sale would best serve the interests of the village and its citizens. A vote is to be held April 2.



GRAND RIVER DAM—General view of main spillway of the government PWA-financed flood and power project in Oklahoma. Gov. Leon Phillips called out the National Guard to prevent its completion until the state receives compensation for flooded roads

Power Board to Start Minnesota Power Probe

Federal Power Commission has postponed to March 25 the hearing scheduled for March 18 at Duluth, Minn., on an order investigating the affairs of Minnesota Power & Light Co. Purpose of the hearing is to determine whether there has been a violation or whether any person is about to violate provisions of the Federal Power Act, and for the purpose of ascertaining the whereabouts, possession, control or custody of the records, books and papers of the Duluth Edison Electric Co. and companies whose properties have been acquired by Minnesota Power & Light Company.

According to the commission's order it appears that the report of the Federal Trade Commission made pursuant to a Senate resolution (Seventieth Congress) indicates that the books of the Minnesota company contained write-ups in the amount of $30,293,346 charged to fixed capital, and that information concerning such write-ups may be contained in the books and records in question.

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TVA Unit on the Line

Last week, two months ahead of schedule, the first 30,000-kva. generator for the Chickamauga Dam project of TVA was started and put on the line. All three generators were designed and built by Allis-Chalmers Manufacturing Co. The field erection of the second unit at the dam is well under way and work has begun on the third unit.

Map Shows Facilities of Utilities in West

Made available this week was a map showing electrical facilities in the far West. Prepared by Frank I. Towle, Jr., it culminates a two-year investigation, embraces all major plant in service the first of this year, and for the first time defines a picture of the elaborately interconnected systems of the Pacific Slope.

Not since 1925 has such a map been prepared, and this one clearly demonstrates the changes which have occurred in the intervening period. The heavy concentrations of generating and transmitting facilities around Boulder Dam and Bonneville are new. But northward from Boulder a line can still be drawn through undeveloped territory, extending 750 miles before the next generating plant or transmission line is touched.

Drawn to a scale of 1 in. equals 20 miles, the map measures 48x68 in., shows voltages and capacities of plants and lines, wire sizes, receiving and interconnecting capacities. Systems are identified and enlargements show subtransmission facilities in metropolitan areas.

The map is being published by *Electrical West* (McGraw-Hill Co. of California) 68 Post Street, San Francisco.

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A.I.E.E. Forms New Section

Announcement has been made by the American Institute of Electrical Engineers of the recent formation of a South Carolina section. Prof. T. F. Ball, head of the engineering department of the University of South Carolina, Columbia, S. C., was elected chairman. Prof. S. R. Rhodes, head of the electrical department of Clemson College, Clemson, S. C., was elected secretary-treasurer.

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Adequate Wiring Bureau

The National Adequate Wiring Bureau has issued a license to the Grand Rapids Adequate Wiring Bureau to operate the certification plan in Grand Rapids and Kent County, Mich. This group became the thirty-first to receive such a license.

•

Extends Date of Sale

Federal Power Commission, on joint application of the two companies, has ordered that the sale of the franchises and facilities of Northern Pennsylvania Power Co. to Metropolitan Edison Co. shall be effected on or before May 6. Previous order of the commission fixed the date for conclusion of the sale as of March 6.

•

New REA Meter

REA is experimenting on a new discount meter, described as a system to even out the load in off-peak periods.

MEETINGS

Association of Iron and Steel Engineers—Spring engineering conference, Cincinnati, Ohio, April 1-2. Brent Wiley, managing director, Empire Building, Pittsburgh, Pa.

Maryland Utilities Association—Spring meeting, Lord Baltimore Hotel, Baltimore, Md., April 5. J. H. Purdy, secretary, Lexington Bldg., Baltimore, Md.

American Chemical Society—Symposium on chemistry of electrical insulation at spring meeting, Cincinnati, Ohio, April 9.

Midwest Power Conference—Palmer House, Chicago, Ill., April 9-10.

Northwest Electric Light and Power Association—Engineering and operation section, Davenport Hotel, Spokane, Wash., April 10-12; Accounting and business practice section, Benson Hotel, Portland, Ore., May 23-24. Berkeley Snow, executive secretary, 707 Spalding Bldg., Portland, Ore.

Arkansas Utilities Association—Annual meeting, Hot Springs, Ark., April 15-16. R. E. Ritchie, secretary-treasurer, Little Rock, Ark.

Missouri Association of Public Utilities—Annual convention, Elms Hotel, Excelsior Springs, Mo., April 17-19. Jesse Blythe, assistant secretary, Merchants Bank Bldg., 101 West High St., Jefferson City, Mo.

Electrochemical Society—Spring meeting, Galen Hall, Wernersville, Pa., April 24-27. Dr. Colin G. Fink, secretary, Columbia University, New York, N. Y.

Illuminating Engineering Society—First annual Pacific Coast lighting conference, Los Angeles, Calif., April 26-27. F. G. Horton, executive secretary, 51 Madison Avenue, New York, N. Y.

American Society of Mechanical Engineers—Spring meeting, Worcester, Mass., May 1-3; semi-annual meeting, Milwaukee, Wis., June 17-21. C. E. Davies, national secretary, 29 West 39th St., New York, N. Y.

Edison Electric Institute—Technical committees, Edgewater Beach Hotel, Chicago, Ill., May 6-9; annual convention, Atlantic City, N. J., June 3-6.

Southeastern Electric Exchange—Annual conference, Hotel Roanoke, Roanoke, Va., May 9-11. J. W. Talley, executive secretary, 308 Haas-Howell Bldg., Atlanta, Ga.

National Fire Protection Association—Annual meeting, Atlantic City, N. J., May 6-11. Robert S. Moulton, technical secretary, 60 Batterymarch St., Boston, Mass.

National Electrical Manufacturers Association—Spring meeting. The Homestead, Hot Springs, Va., May 12-17. W. J. Donald, managing director, 155 East 44th St., New York.

National District Heating Association—Annual meeting, French Lick Springs Hotel, French Lick, Ind., May 14-17. John F. Collins, Jr., secretary-treasurer, 1231 Grant Building, Pittsburgh, Pa.

National Electrical Wholesalers Association—Annual convention, The Homestead, Hot Springs, Va., May 19-23. E. Donald Tolles, managing director, 165 Broadway, New York, N. Y.

Pacific Coast Electrical Association—Annual convention, Hotel Oakland, Oakland, Calif., May 22-24. Harold Q. Noack, Hubbard & Co., Oakland, convention chairman.

American Society for Testing Materials—Annual meeting, Chalfonte-Haddon Hall, Atlantic City, N. J., June 24-28. R. E. Hess, assistant secretary, 260 South Broad St., Philadelphia, Pa.

American Institute of Electrical Engineers—Summer convention, Swampscott, Mass., June 24-28. H. H. Henline, national secretary, 33 West 39th St., New York.

Canadian Electrical Association—Fiftieth annual convention (Golden Jubilee), Seigniory Club, P. Q., Canada, June 25-28. B. C. Fairchild, secretary, 804 Tramways Bldg., Montreal, Canada.

Commission Reports Accident Statistics

Of the total of 6,463 utility accidents in Pennsylvania during 1939, according to a report by the Public Utility Commission of that state, 412 or 6.4 per cent were chargeable to electric utilities. The ratio of fatalities was somewhat smaller, 27 out of a total of 473, or 5.7 per cent, and the number of persons injured was 401 out of 7,281, or 5.5 per cent.

Of the 27 persons killed, twelve were employees, two trespassers and thirteen others. Most of the injured were employees: 349, against ten trespassers, five customers and 37 others. Again, nineteen of the 27 deaths and 44 of the 401 injuries were due to contact with charged wires or other equipment, while three deaths and 111 injuries were due to falling.

Other persons injured included 57 hurt by striking against objects or being struck, 56 by handling materials, 25 involving use of tools, nineteen by defects or failure of equipment or machinery.

The report gives accident statistics also for other classes of utilities. The largest numbers, as might be expected, were those involving street railways, railroads, and motor transportation.

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Upholds Washington PUD

In a ruling by the state Supreme Court at Olympia, Wash., the validity of the Okanogan County public power district was upheld, the court ruling that ample publicity was given before election time to the proposal to form the district. It was alleged that the district was improperly formed in 1936 and its proposed tax levy illegal.

•

Project Cost Determined

FPC has determined the actual legitimate original cost of hydro-electric project No. 693, owned by the Town of Highlands, N. C., licensee, as $96,342, as of the license date, December 31, 1928. This determination has been accepted by the town authorities.

•

Starts Work on Plant

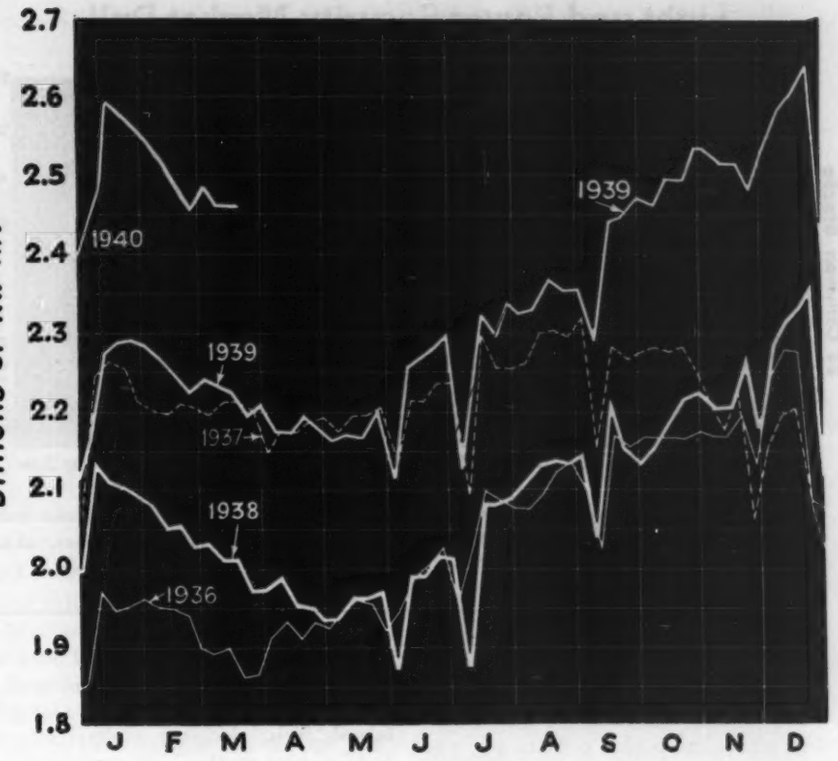
Pennsylvania Power & Light is now engaged in preliminary construction work on the $3,000,000 extension to the Cedar steam-electric station at Harrisburg. Orders have been placed with manufacturers for major items of equipment. Others are to be placed in the near future.

Output Holds Gains Over Earlier Years

Production of electricity by the electric light and power industry during the week ended March 16 totaled 2,460,317,000 kw.-hr., according to the Edison Electric Institute, a dip of 0.15 per cent from the previous week but 10.6 per cent ahead of the output in the corresponding week of 1939.

Even with the dip from the week of March 9, the curve remains above the mark for the week ended February 24, the previous low. Margins over the earlier years are also being maintained, the gain over 1938 being 21.9 per cent and over 1937, the previous high year, 11.3 per cent. In terms of the winter peak, output for the week ended March 16 showed a drop of 6.9 per cent, as compared with declines of 5.8 per cent in 1939, 8.4 per cent in 1938 and 2.9 per cent in 1937.

Again, the Rocky Mountain and Central Industrial states reported the largest regional increases over 1939 —18.0 and 13.5 per cent, respectively— with the New England and Pacific Coast groups showing the smallest percentage gains.



Weekly Output Millions Kw.Hr.

1940		1939		1937	
Mar. 16	2,460	Mar. 18	2,225	Mar. 20	2,211
Mar. 9	2,464	Mar. 11	2,238	Mar. 13	2,213
Mar. 2	2,479	Mar. 4	2,244	Mar. 6	2,200
Feb. 24	2,455	Feb. 25	2,226	Feb. 27	2,207
Feb. 17	2,476	Feb. 18	2,249	Feb. 20	2,212
Feb. 10	2,523	Feb. 11	2,268	Feb. 13	2,200

Per Cent Change from Previous Year

	Week Ending		
	Mar. 16	Mar. 9	Mar. 2
New England	+ 6.3	+ 5.4	+ 8.4
Middle Atlantic	+ 8.3	+ 9.2	+ 9.0
Central Industrial	+13.5	+13.4	+13.9
West Central	+10.7	+11.3	+ 8.0
Southern States	+10.8	+ 8.5	+ 8.0
Rocky Mountain	+18.0	+15.7	+19.4
Pacific	+ 5.5	+ 2.5	+ 6.1
United States	+10.6	+10.1	+10.5

Vallejo Electric to Build New 10,000-Kw. Substation

In order to take care of the fast growing territory served by Vallejo Electric Light & Power Co., Vallejo, Calif., the company is building a new brick and steel substation in the northeastern part of the city.

For the present, R. C. Bragg, assistant manager, said, the station will have three feeders with a total capacity of 6,000 kw., 4 kv. The full capacity of the station is to be 10,000 kw. Ground is to be broken in the near future and it is expected that the new $80,000 station will be in full operation by next July.

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Portland PUD Vote

Portland, Ore., will vote in the May 17 primary on setting up the framework of a people's utility district, as a result of the obtaining of sufficient signatures on a petition for a vote. The vote will be on the issue of forming a PUD, the election of five directors to administer it, survey possibilities of acquiring distribution systems and levy a property tax not to exceed 2 mills a year for not more than five years for administrative purposes. Revenue bonds needed to acquire electric facilities would have to be submitted to a separate vote of the people.

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Order Utility Inquiry

The Mississippi House of Representatives has ordered "a sweeping investigation of the financial structure, earning power and other activities of public service corporations and utilities" in the state. The measure was passed on the ground that there now "exists an immediate and urgent necessity to find new sources of revenues to finance the benevolent and humanitarian program sponsored by the administration."

•

FPC Grants Time Extension

Federal Power Commission has granted the petition of the Arkansas Power & Light Co. for a further extension of time to May 31 in which to comply with Electric Plant Accounts Instruction 2-D of the commission's Uniform System of Accounts.

Quebec Electric Energy Sales Rise 13.8 per Cent

Substantial increases over 1938 are shown in statistics on production and sales of electric energy in the Province of Quebec, recently issued by the Provincial Electricity Board. Figures issued by the board are based on returns filed by the 29 principal distributors which generate and distribute 99 per cent of the electrical energy generated by privately owned distributors in the Province. As municipally-owned systems do not fall within the jurisdiction of the board, their sales and revenues are not included.

Total production for 1939 amounted to 15,228,242,039 kw.-hr., comparing with 13,507,978,178 kw.-hr. for 1938, an increase of 12.7 per cent. Total sales showed an increase of 13.8 per cent.

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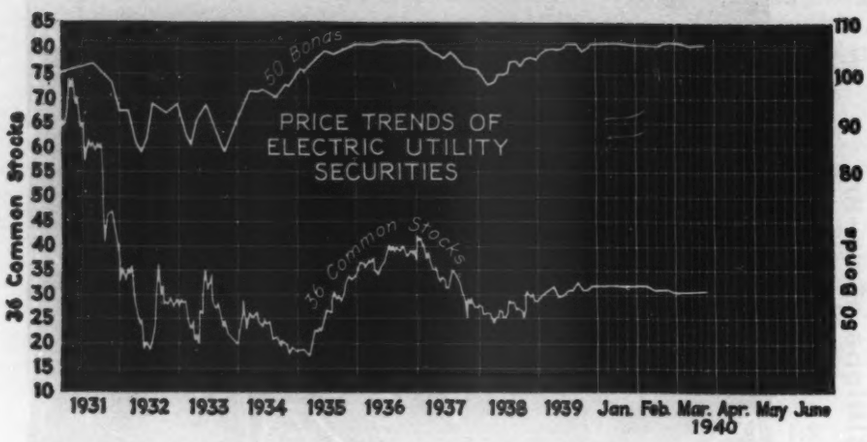
Georgia Power Plant

Excavation for the Georgia Power Company's new steam plant at Macon, to cost around $4,000,000, is under way and contracts are being let. The plant will be completed in the middle of 1941.

Light and Power Security Market Dull


PRICE TRENDS OF
ELECTRIC UTILITY
SECURITIES
50 Bonds
36 Common Stocks
36 Common Stocks
50 Bonds
85 80 75 70 65 60 55 50 45 40 35 30 25 20 15 10
110 100 90 80
1931 1932 1933 1934 1935 1936 1937 1938 1939 Jan. Feb. Mar. Apr. May June 1940

Utility stocks moved within a narrow range this week. A mixture of slight losses and gains brought the "Electrical World" index to 30.7, last week, 30.8; last year, 30.8. Bonds remained unchanged at 106.2.

Utility Petitions Registered with SEC

Indianapolis Power & Light Co. has filed a registration statement under the Securities Act of 1933 covering 715,980 shares of common stock, no par value. The company proposes to sell 70,000 shares of the common stock, and the remaining 645,980 shares are to be sold by Charles True Adams, trustee of the estate of Utilities Power & Light Corp.

According to the registration statement, the net proceeds to be received by the company from the sale of 70,000 shares of common stock will be used to reimburse its treasury for capital expenditures.

SEC has announced that Continental Gas & Electric Corp. has filed a declaration under the Holding Company Act for approval of a $330,000 contribution during the year 1940 to the paid-in surplus of its subsidiary, Panhandle Power & Light Co. It is proposed that $200,000 of the amount be contributed as soon as the declaration becomes effective and the balance at intervals during 1940 as needed by the subsidiary company. The funds are to be used by Panhandle Power & Light for construction purposes, it is stated.

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Utility Companies to Pay Dividends on Arrears

At a recent meeting of the board of directors of Southwestern Light & Power Co. a dividend of 87½ cents per share on the $6 cumulative preferred stock was declared as a payment on the dividend accumulations in arrears. This dividend will be payable April 1 to stockholders of record March 20. The regular dividend of $1.50 per share was also declared on this stock.

Directors of Central Power Co., Grand Island, Neb., declared a dividend of $1.75 a share on the 7 per cent cumulative preferred stock and $1.50 a share on the 6 per cent cumulative preferred stock as payment on the dividend accumulations in arrears; this dividend will be payable April 15 to holders of record March 30. The regular dividend of $1.75 on the 7% cumulative preferred and $1.50 on the 6% cumulative preferred was also declared.

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Orders Cut in Law Fees

Securities and Exchange Commission has ordered reductions of $12,000 in fees sought by three law firms in connection with registration of securities sold last June by the Indiana & Michigan Electric Co.

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Banking Syndicate Sells 200,000 Edison Shares

One of the largest distributions of utility common stock in the last year was effected last week when an underwriting syndicate, headed by Dillon, Read & Co., sold 200,000 shares of common stock of the Commonwealth Edison Co. at 32⅜ a share. The stock involved in the deal had a total value of $6,475,000.

Dillon, Read & Co. purchased the securities from the Continental Illinois Bank & Trust Co. of Chicago. Purchase was made in the form of Commonwealth Edison convertible debentures. These debentures are convertible into the utility's common stock at the ratio of four common shares for each $100 of debentures. The Continental Illinois Bank & Trust Co. has a substantial stock and debenture interest in Commonwealth Edison arising out of the collapse of the Insull system.

The response was so great, according to the bankers, that all the stock was sold in less than two hours.

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Asks Court Action on Utility Plan

SEC filed an application in the federal court for the Southern District of New York this week requesting affirmation and enforcement of a plan of reorganization for the Community Power & Light Co. This marks the first appeal by the SEC to a court to pass on a plan for simplification of corporate structure under Section 11(e) of the Public Utility Holding Company Act.

In August, 1939, Community Power & Light Co. filed with the commission a voluntary plan of corporate simplification designed to bring about compliance with the provisions of Section 11(b) (2) of the Holding Company Act. Following a public hearing, the commission, in November, 1939, found the plan to be fair and equitable and necessary to carry out the provisions of Section 11(b) (2) of the Holding Company Act.

Thereafter, according to the terms of the plan, the stockholders were given an opportunity to approve such plan, and at a special stockholders' meeting held in Wilmington, Del., on January 17 the plan was approved by more than two-thirds of the first preferred-stock holders and by more than a majority of the common-stock holders.

The application which the commission filed requests the court to find the plan to be fair and equitable and appropriate to carry out the provisions of Section 11 of the Public Utility Holding Company Act of 1935. The court has also been requested to set a date for a hearing on the plan.

Utility Reports

	Net Income 1939	1938
*Mississippi Power & Light..	$446,205	$649,493
*Mountain States Power.....	579,213	512,013
*Northwestern Electric	423,830	461,580
*Philadelphia Electric 22,595,521		21,652,707
*Southern California Edison..12,701,916		11,733,479
*Potomac Electric Power..... 4,230,271		4,187,910
	1940	1939
†Alabama Power	4,083,779	3,446,548
†Central Illinois Light.....	2,138,397	1,906,246
†Georgia Power	4,864,735	4,674,199
†Kansas City Power & Light..	3,920,181	3,729,108
†Ohio Edison	4,158,857	3,805,437
†Pennsylvania Power	812,653	549,347

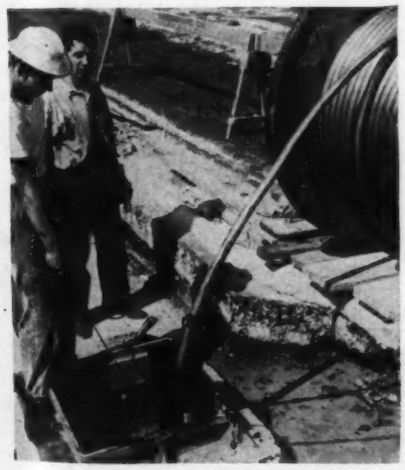
*Twelve months ended December 31.
†Twelve months ended January 31.

OPERATING PRACTICES

Run 26.4-Kv. Cable Down Steep Slope

By H. SORENSON
Wisconsin Electric Power Company, Milwaukee

How best to install a 26.4-kv. cable down a steep slope was one of the engineering problems encountered by the Wisconsin Electric Power Company in supplying energy to Milwaukee's new city water purification plant. Two independent power lines, one a 13.2-kv. line from the Lakeside power plant and the other a 26.4-kv. line from the Port Washington plant, feed duplicate 2,000-kva. transformers that can be operated at either 13.2 or 26.4 kv. The plant can be supplied from either or both transformers.



PERFORATED BUCKET speeds greasing of 26.4-kv. cable as electrolysis preventive

The 26.4-kv. cable—three conductor, No. 2/0 paper-lead—enters the plant site from the north and at one place drops 62 ft. in a horizontal distance of 180 ft. The last three joints in this cable before the high bank is reached were filled with heavy insulating compound. Single-conductor, varnished-cambric-insulated, lead-sheathed cables were used on the steep slope to eliminate the cable oil migration inherent in paper-insulated cables.

A trifurcating semi-stop joint was installed between the two kinds of cable in the manhole on top of the bank, using varnished silk tape as an oil-barrier. The lead of the single-conductor cables was brought well into the joint sleeve and the varnished silk tape was applied from the conductor connector to a point past the end of the single-conductor lead sheath.

Half way down the hill an anchor manhole was built to support the weight of the cables. In this manhole the cables were offset to allow some cable movement. Grease was used on the lead sheaths of cables as an electrolysis preventive.

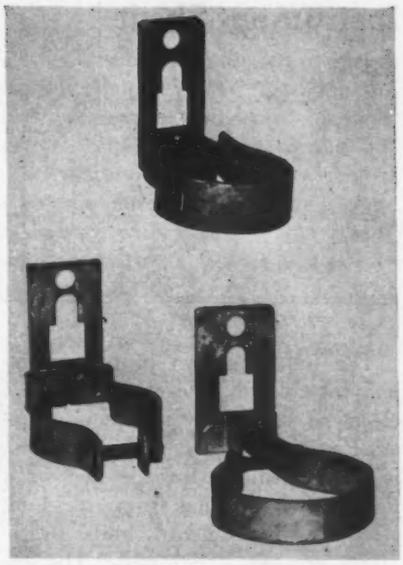
•

Lightning Arrester Mounting Standardized

By B. J. BARMACK
Engineering Department,
Commonwealth Edison Company, Chicago

On the distribution system of the Commonwealth Edison Company there are at present more than 32,000 3-kv. lightning arresters of 20 types purchased from three manufacturers. Many of these arresters have been on the lines since 1914.

Since in the replacement of arresters considerable difference was found in the hangers used for mounting arresters on crossarms or structures, a standard arrester mounting seemed desirable. Some mounting brackets were made to fit over the top of the arm, with the mounting bolt installed through the top of the bracket. In another type the bracket was made for attachment on the side of the arm with a single bolt. Again, in another widely used type, brackets necessitated two bolts for fastening on the side of the arm. Distance between mounting holes of this type varied considerably, requiring boring new holes when an arrester was replaced with one of a different make. Mounting bolts also vary in size from $\frac{3}{8}$-in. to $\frac{1}{2}$-in. diameter.



STANDARDIZE on single mounting for all distribution arresters to simplify replacement problems

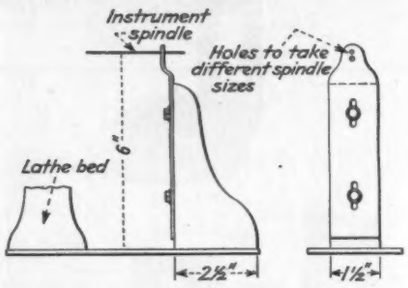
Standardization of brackets and of bolt sizes was, therefore, a very desirable step, particularly for distribution type arresters. However, this program could be extended to other classes of lightning arresters, including the 33-kv. class. The type of mounting selected for all arresters purchased for 1940 work is shown in the figure. Although the brackets are furnished by three different manu-

facturers they are all uniform in type and size of mounting holes. A similar type of bracket was ordered for all neutral wire arresters.

Consideration is now being given to standardization of the diameter of the bracket opening, so that one type of bracket could ultimately be used on any 3-kv. arrester of modern construction. This would result in greater salvage value of the brackets and would also permit more economical installation of new arresters.

•

Lathe Fixture Holds Instrument Shaft



The fixture shown in the accompanying sketch, developed in the electrical laboratory of the Consumers Power Company, Jackson, Mich., is an attachment for the bed of a jeweler's lathe that supports long electrical instrument shafts while pivots are being reground. The fixture supports the pivot end of the instrument shaft about ¼ to ½ in. from the end. Regrinding is done under a microscope using (1) Pike Arkansas stone to bring the pivot to a sharp point (10 deg. less than the angle of the jewel), (2) Jasper stone for rounding the point, and (3) Vienna lime for polishing.

Capacitors Improve Distribution Conditions

By JOHN L. COLLINS
Plant Engineer Central Maine Power Company, Augusta, Me.

Following an analysis of system conditions on the G. E. calculating board and in the field, it was found that a probable minimum of about 18,000 reactive kva. could be used correctively on Central Maine Power. Distribution type capacitors split into relatively small and scattered units were installed in areas where industrial load wattless afforded opportunity for power-factor correction with flexibility of application. This was considered preferable to the use of centralized synchronous equipment at a higher installed cost per kva. and associated increase of wattless current on certain lines leading to such a central location. An initial installation costing $42,586 was made in July, 1939, comprising 368 15-kva. units of G. E. Class ID pole type capacitors in 51 groups aggregating 5,520 kva. Sizes of groups ranged from 45 to 180 kva., and the result was a reduction of 3,300 kva., or 0.6 kva. per capacitor kva. The current reduction was 825 equivalent three-phase amps. at 2,300 volts, obtained from actual system test with capacitors on and off. That is, the total equivalent amps. dropped from 4,035 to 3,210 when the capacitors were switched into circuit.

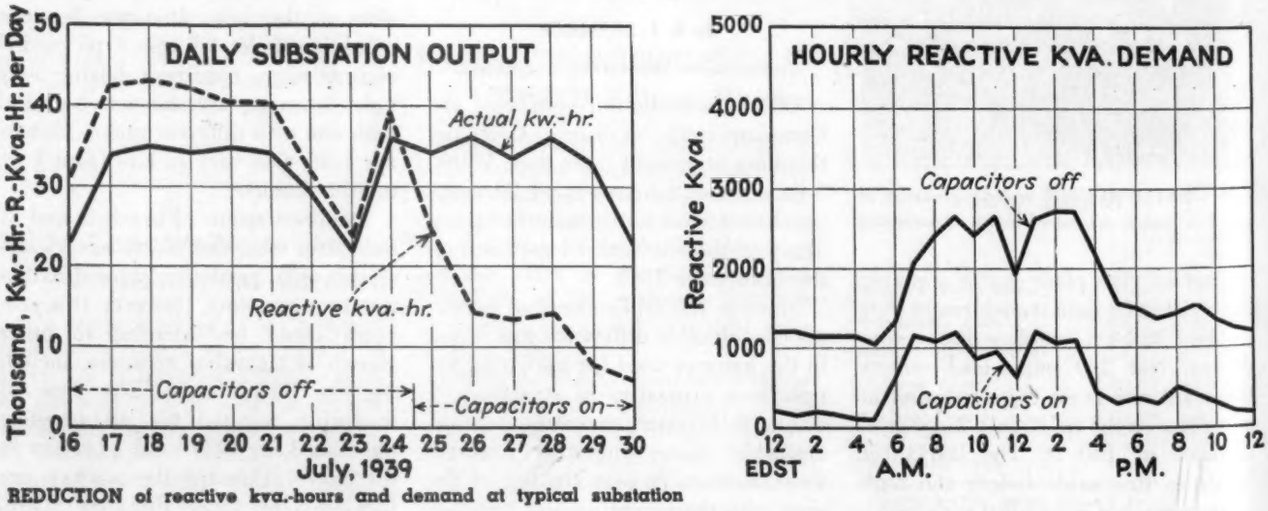
The entire lot of 51 installations was put into service and tested for individual effectiveness in fourteen working days.

In general the procedure was to make a first rough check of conditions in substations and industries suspected of having large wattless currents, using a portable polyphase indicating power-factor meter. The final check is made with a graphic reactive kva. meter, like the Lincoln demand meter, with a "Superior Reactiformer." The continuous record circular charts are preferred to fifteen-minute interval charts for this work. Charts with outside zero give better results than center zero charts on our tests, since the accurate data are most needed on the minimum reactive loads, such being the determining factor as to the amount of capacitor kva. that can be installed without control, subject to some increase if the feeder size is large enough.

In all cases the minimum chart reading of reactive kva. on a substation is taken as the total maximum kva. of capacitors that should be installed without control somewhere on the feeders supplied from that substation. At lightest loads the result approximates unity power factor, and the improvement under loaded conditions is allowed to come where it will. The development of some inexpensive method of control would permit a

Cost Breakdown for Installing 5,520 Kva. In Capacitors

Item	Quantity	Amount
Capacitors	368	$35,519
Crossarm hangers	123	775
Crossarms	253	342
Cutouts	165	1,046
Arresters	165	996
Ground rods	98	134
Hardware		210
Wire and insulators		203
Miscellaneous material		430
Expense		1,626
Engineering		405
Interest charges		85
Indirect charges		347
Total		$42,586
Per kva., installed		$7.71



REDUCTION of reactive kva.-hours and demand at typical substation

better condition to be realized under load than is at present practicable.

In cases where the industrial reactive minima do not add up anywhere near to the minimum reactive taken at the substation, individual feeders are then studied as to readings, wire size, length to load center, use of voltage regulators, etc. Usually one or more feeders of large wire size and short length are found where additional capacitors may be installed even beyond that particular feeder's requirements for unity power factor at light load. The main point is to have ample copper in the line back to the substation bus. We keep large capacitor installations off the smaller lines lest we run into danger of blowing fuses over week-ends caused by undue rise of distribution voltage, which in itself may be an objectionable service condition.

The most efficient installation crew, four men and a small truck, averaged to put up two units per day, including traveling time.

The simultaneous test occurred August 8, when linemen at each installation cut off all capacitors for a predetermined ten minutes, during which station and substation operators made the necessary readings to determine the effect of the 5,520 kva. in added units. It appeared that reduced kva. loads on the system will approximate 60 per cent of the installed kva. in capacitors under the existing conditions. With a minimum reactive load existing at any one time of about 18,000 kva. there is an indicated difference of at least 11,000 kva. between actual and apparent kva. at light load periods.

•

Cost of Installing Power Transformers

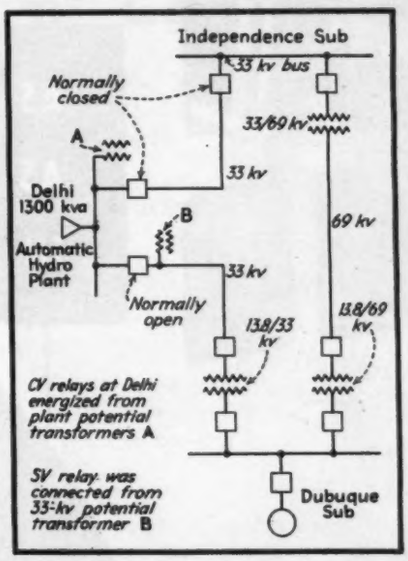
From the construction records of an Eastern power company have been taken the following cost data applying to a 750-kva. transformer and single-phase induction regulator installation in an outlying substation completed in 1937:

Three 250-kva. transformers	$2,952.00
Two single-phase, 48-kva. induction regulators, 2,400/4,800-volt, buck and boost 5-20 per cent	3,628.80
Engineering	746.37
Labor and payroll expenses, with supervision	1,545.14
One three-pole oxide film lightning arrester, 25 kv	200.00
Steel structural material	466.00
Eight high-tension fuses	268.30
Test blocks	44.59
Wire fence	200.05
Miscellaneous costs	837.05
Total	$10,888.30

Relay Scheme Starts Hydro Station

An interesting relay arrangement was adopted by engineers of the Interstate Power Company, Dubuque, Iowa, recently to permit a 1,876-kva. automatic hydro station at Delhi to be started from either of the remotely located Independence or Dubuque substations.

The automatic station at Delhi is



START hydro station from either of two remotely located substations

tied to both the Dubuque and Independence substations by 33-kv. lines through oil circuit breakers. The bus at Delhi was normally energized from Independence through a normally closed oil circuit breaker. The breaker connecting the Delhi bus to the Dubuque 33-kv. line was normally open. CV relays energized from the Delhi plant on the line on undervolt-transformers (A) would bring the Delhi plant on the line on undervoltage when the 33-kv. breaker at Independence was killed momentarily, but the plant could not be started from Dubuque since the plant potential transformers, as mentioned, were energized from Independence.

To solve the problem an SV relay energized from the hot Dubuque 33-kv. line potential transformer (B), but with its normally closed contacts in series with the energizing coil of the CV relay, was installed. Thus, when the 33-kv. breaker at Dubuque substation was opened momentarily the SV relay dropped out, opening the energized coil of the CV relay and starting the station as desired.

•

New Artificial Load for Meter Testing

By J. E. BURNEY
Superintendent of Meters
Alabama Power Company, Birmingham

For years meter departments have felt the need of a satisfactory artificial loading device for use in testing industrial and large power customer meters. With the advent of the 2½-amp. primary, or polyphase meter, it became more apparent that a loading device with a satisfactory phase angle for testing at 50 per cent power factor should be developed.

The meter department of the Alabama Power Company, in conjunction with the States Company, Hartford, Conn., has developed an artificial loading device that will facilitate field testing in the future. With the features embodied in this device testers can test at the same current values regularly, regardless of system voltage changes. This in itself expedites meter testing and also makes it much easier.

This loading device provides current by the "phantom load" principle, whereby current is supplied from a step-down transformer at a voltage sufficient to deliver current through the impedance of a number of 2½- or 5-amp. current coils at variable current values. This is controlled by a set of switches that cut in fixed resistances for ⅛, ¼, ½, 2½ and 5 amp. Exact current is controlled by a variable resistance and reactance which is indicated on a built-in ammeter. Full load current is supplied at 50 or 100 per cent power factor by cutting in or out reactors in the output circuit.

Supply potential is controlled by a regulator, which varies voltage from 100 to 125 or from 200 to 250. The potential is indicated on a built-in voltmeter. In addition, the voltmeter and ammeter can be used independently of the load box for making current or voltage tests.

Presenting

The G-E

AS EASY TO LOOK AT
AS THE RECORDS
IN YOUR FILES

Dual Testing Facilities—G-E Drawout Relays Can Be Tested On or Off the Switchboard

YOU GET DRAWOUT RELAYS WITH
COMPLETE G-E SWITCHGEAR

Drawout Relay

A NEW Feature with G-E Switchgear Equipments AT NO EXTRA COST

THIS outstanding development gives you many important advantages. It provides complete accessibility—facilitates testing—conserves panel space—simplifies and minimizes wiring.

The drawout relay was designed to meet modern operating requirements. Note its simplicity:

1. Sturdy, dustproof, stationary case—mounted and wired permanently.
2. Self-supporting cradle, carrying standard relay element and terminals.
3. Connecting plug, making positive silver-to-silver contact between relay terminals and studs in the stationary case.
4. Easily removable cover with target reset button.

Get all these advantages by specifying G-E complete switchgear equipments. For further information, ask for a copy of GEA-3037 or get in touch with your G-E representative. General Electric, Schenectady, N. Y.

IMPORTANT STEPS IN THIS DEVELOPMENT

1927	PLUG-TYPE NETWORK RELAYS
1930	UNIVERSAL RELAY CASE
1936	SEMIFLUSH RELAY MOUNTING
1940	DRAWOUT RELAYS

NO TOOLS NEEDED—NO WIRES TO DISCONNECT

GENERAL ELECTRIC

INDUSTRIAL ENGINEERING

Exhaust Fan Drive Improves Power-Factor

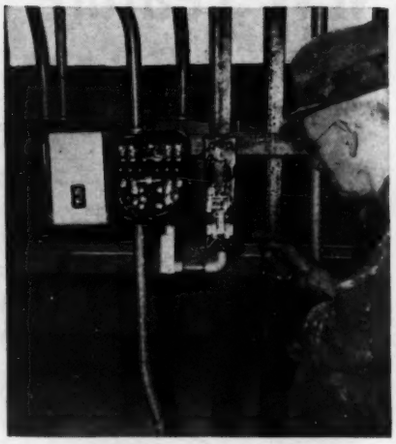
In modernizing the motor drives in its Brockton, Mass., factory the Doyle Shoe Company eliminated a 90-hp. steam engine with an extensive system of shafting and belt connections, installing a total of 27 motors with an aggregate of 88 hp. The power-factor was about 70 per cent with a purely induction motor load, but it is now close to 100 per cent. Two factors in this improvement are a number of specialized electrical units for the production of steam vapor by an electrolytic process installed by the Boston Manufacturing Company, Whitman, Mass., and a 25-hp. Fynn-Weichsel motor driving a 50-in. Sturtevant blower for exhausting leather dust from various machines. The motor alone reduces the demand charge by about $60 per year.

The motor has a running speed of 1,200 r.p.m., driving the blower pulley (12 in. diameter) from an 8-in. pulley by triple V-belt. The control, starting resistances and other accessories are mounted on the adjacent wall. The blower load is relatively uniform and the drive is in use at all times when the factory is in production.

•

Relays Prevent Unneeded Shutdowns

Time-delay relays, used with automatic motor starters, having the usual no-voltage and thermal-overload protection on the main mill motors at the General Foods Company corn mill at Kankakee, Ill., prevent these essential process drives from bogging down with momentary loss of voltage and from making it necessary to hold up the entire plant until the electrician can start them up by hand.



RELAY holds essential plant motors on the line for four seconds after momentary loss of voltage, avoiding unnecessary shutdown

In operation, the function of the relay is to keep the main motor contacts closed for four seconds after loss of line voltage. If voltage recovers within that period the motor will start up automatically and continue operation where it left off without requiring attention.

Essentially the relay consists of a solenoid energized by line potential and with its armature mechanically connected, through an escapement wheel, to contacts which are closed when the motor is operating. On loss of voltage the solenoid is de-energized and the armature starts to drop out. The escapement wheel retards its movement, introducing a four-second delay between de-energizing the solenoid coil and tripping of the contacts when the armature reaches full "out" position.

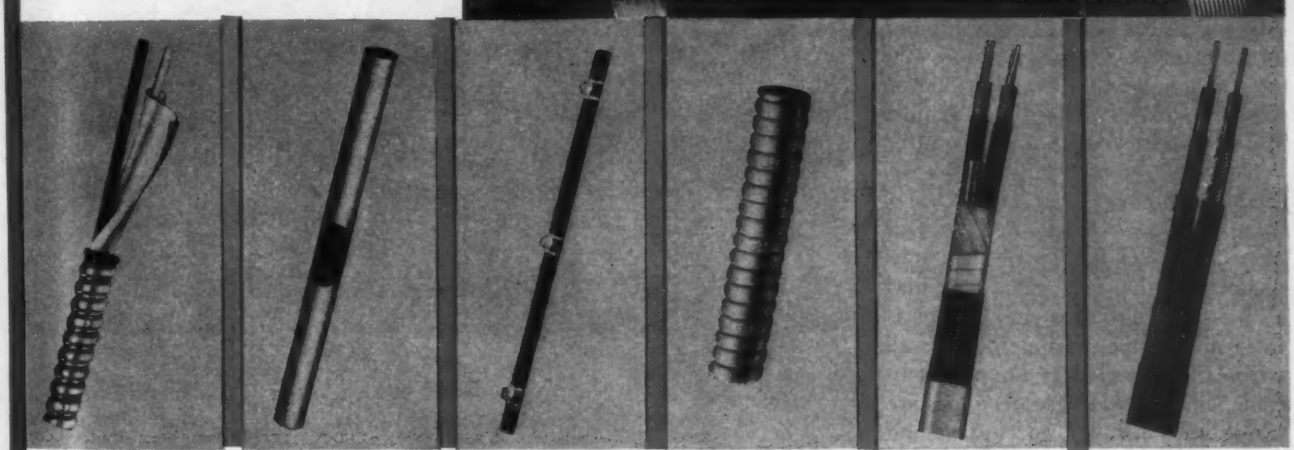
CORRECTIVE MOTOR used to improve conditions in shoe plant

It Pays to Use

GENERAL ELECTRIC QUALITY CONDUIT PRODUCTS

G-E WHITE PROTECTS WIRING PERMANENTLY

G-E White quality rigid conduit is resistant to heat, flame, gas, acids, alkalies, moisture and mechanical injury. Only the finest raw materials are used in its manufacture. Mild, rimmed steel is hot-dipped galvanized and Glyptal coated inside and out. It has clean accurate threads and is easy to bend and to install. A complete line of G-E boxes and fittings is available.



G-E BX Armored Cable
Has new S-shaped paper wrap which provides added dielectric strength and more protection at bushing.

G-E Electrical Metallic Tubing
A thin-wall rigid raceway electro-galvanized on the outside and black enameled on the inside. Bends accurately.

G-E "Fiberduct" Underfloor Raceway
Flat, oval fiber tubing forming system of noncorrodible raceways in concrete floors. Carries wires for light, power, telephones, etc.

G-E Flexible Metallic Conduit
Consists of interlocking flexible galvanized steel strip. Adaptable for sign wiring, streetcar wiring, temporary wiring, etc.

G-E Service Entrance Cable
Both G-E Type SE, Style A and Style U are flexible, light in weight, bend easily and require the simplest fittings.

G-E BraidX Non-metallic Sheathed Cable
Has covering with high resistance to moisture, flame and mechanical injury. For wiring old and new buildings.

For further information on G-E White Rigid Conduit or other G-E Conduit Products see the nearest General Electric Merchandise Distributor or write to Section C-0133, Appliance and Merchandise Department, General Electric Company, Bridgeport, Connecticut.

GENERAL ELECTRIC

MOTOR CONTROLS located within arm-radius of operator

Convenience Features Grinder Motor Drives

Time saving and safe operation are combined in this new machine tool installation at the plant of F. E. Myers Brothers Company, pump manufacturers, Ashland, Ohio, the unit shown being a 6 x 3-in. Norton type C plain cylindrical grinder equipped with four motors operating on 220 volts direct current. In contrast with former practice, where home-made belt and chain guards were often installed by the tool purchaser, this equipment is provided with a smooth surface guard which is integral with the machine design; all wiring is concealed as far as practicable, and two of the four motors are inside the machine, occupying no otherwise productive space. Starting contactors and a speed-changing rheostat are mounted in metal-clad cases or inside the machine frame, instead of on a nearby wall or post requiring additional investment in wiring, and the motor on the grinder wheel is supplied through oil-proof cable instead of flexible metallic conduit. The space around the machine in the shop is thus freed for manufacturing purposes only.

The motor at the upper left drives the head stock and is a ¼-hp. Century shunt-wound unit, with speed range from 650 to 2,600 r.p.m. through the rheostat handle at operator's left. The wheel disk is driven by a 5-hp. constant-speed motor with push-button and magnetic starter control at the right and the interior oil pump, which provides pressure for operating the table back and forth, is driven by a ¾-hp. motor of the totally inclosed, ball-bearing type. A ½-hp. motor inside drives a "coolant" pump supplying water at the grinding edge of the tool. These are Century motors. Control was provided by General Electric and the pump motors are controlled by snap switches. Subordination of the motor drives, wiring and control to the manufacturing aspects is proving most beneficial.

•

Polaroid Fixtures Help in Drafting Room

By G. A. KANE
Engineering Vice-President
Northern Pump Company, Minneapolis, Minn.

Polaroid lighting fixtures have been installed in our drafting room to facilitate night drafting work and are proving quite satisfactory.

We have a single polaroid fixture on each drafting table to supplement the normal overhead lighting. There are now 40 units installed in our drafting room at the present time and most of the units are equipped with four 50-watt frosted bulbs, which results in an intensity of from 55 to 30 ft.-candles on the boards. Some of the units are equipped with two 30 watt Mazda white fluorescent tubes. With this combination the intensity on the boards is from 60 to 35 foot-candles.

The intensity and the variation in intensity over the boards depend to a considerable degree on the height of the units above the boards. This is adjustable and the above data pertain to the adjustments which have been found to be most satisfactory by the individual draftsmen. The major advantage of these units is the elimination of glare which results from most direct lighting systems.

40 POLAROID FIXTURES in Minneapolis drafting room supplement overhead lighting, providing up to 60 ft.-candles on boards

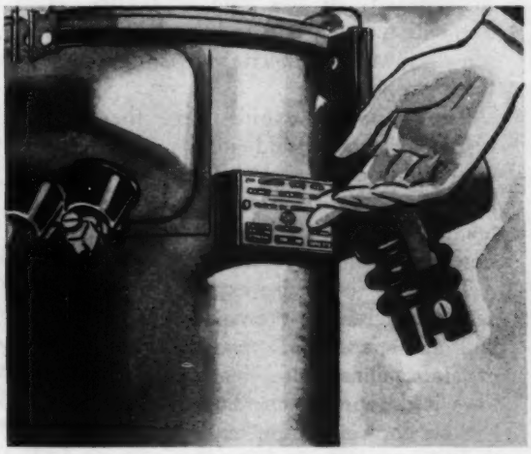
The Case of the Drooling Transformers

to keep oil inside transformers and moisoutside was beginning to get us down. Our ibution department investigated siphonleakage, and half a dozen other clues . . . ill we were stumped by drooling tubs.

2 It was a Line Material sales engineer who got us to thinking maybe he had the answer. "L-M stud type bushings stop the siphoning," he said, "and L-M tanks are really sealed moisture tight." Then he proved it.

3 First, he showed us the under side of the L-M Transformer cover. The gasket in that L-M cover is confined in a double-ridged channel seat, held permanently in place by double walls.

, he pointed out the gaskets around the idual L-M primary and secondary bush- You never saw a snugger fit anywhere, even in a Miss America contest.



5 How the L-M people even guard against name plate rivet holes as a potential cause of oil loss was the next thing he showed us. The L-M name plate is *not riveted* directly to the tank. It is riveted on a base which is *welded* to the tank.

6 The pay-off came when I visited the new L-M Transformer plant and saw the L-M "upside down leakage test". Rows of new, oil-filled transformers suspended upside down, with the oil inside pressing against the most vulnerable leakage spots . . . the floor below clean as a whistle.

The initial oil level inside L-M Transformers is always at least two inches above the terminal block. This high initial oil level, plus the careful L-M protection against oil loss, assures lasting submersion of the terminal studs. The result is full use of the oil's *insulating* as well as its cooling properties, and the elimination of terminal flash-overs. Plenty of oil in an oil-tight tank . . . here is unquestionably another important factor in the remarkably trouble-free service record L-M Transformers have maintained.

LINE MATERIAL CO.

NEW ENGINEERING IDEAS

Novel Power Element Design for Thermostat

By C. F. ROBBINS
Development Engineer
Cutler-Hammer, Inc., Milwaukee, Wis.

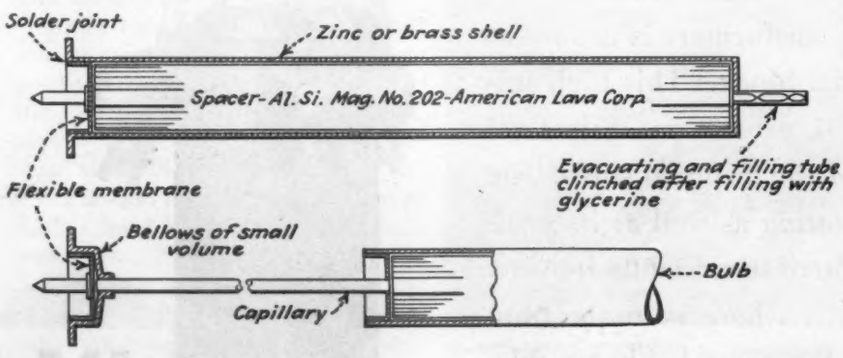
Thermostats using liquid expansion or vapor pressure principles to convert temperature changes into movement or power for operating electric contacts to control such temperature changes are used primarily because of their advantage over bimetal thermostats for remote control, *i.e.*, the switch can be placed at a distance from the point of temperature change by means of a length of tube between bulb and bellows, the volume or pressure change in the bulb being transmitted to the bellows or diaphragm to actuate the switch. However, in heating devices such as water heaters, loss of filling medium from the power element due to leaks or porosity in joints, bellows or tubing causes failures which result in generation of steam, operation of safety devices and burnouts of heaters.

Therefore a system was built reversing the operating of the fluid power elements so that loss of fluid would result in opening of contacts. It was so designed that the bellows will contract upon heating the bulb and expand upon cooling the bulb. This was accomplished by designing a bulb of relatively large volume, the shell of which is made from a highly expansive material such as zinc. A spacer having a very low temperature coefficient of expansion was made to fit very closely inside the bulb. The spacer must fill as many voids as possible and, therefore, must have a high density or low rate of liquid absorption. Such materials as quartz glass, invar, cordierite, etc., have these properties.

The remaining voids were then highly evacuated and solidly filled with a low-expansive, non-corrosive liquid, such as glycerine, in the same manner as ordinary liquid expansion power elements are filled.

The bulb in service expands upon heating, increasing the voids between bulb and spacer more than the liquid expands. Thus liquid from the bellows is drawn into the bulb and the bellows contracts upon heating, opening the switch contacts to de-energize the heater. The amount of bellows movement depends on the type and "effective area" of bellows or diaphragm used and size of bulb. Movements of 0.005 in. for each 10 deg. C. change in temperature are practical to obtain.

The response of the device to temperature change is rapid because operation will take place as soon as the shell is heated or cooled without the necessity of heating or cooling the mass of the spacer thoroughly, since the change in volume of the spacer with temperature is negligible due to its very small expansion coefficient.



SKETCH of reverse operation bellows

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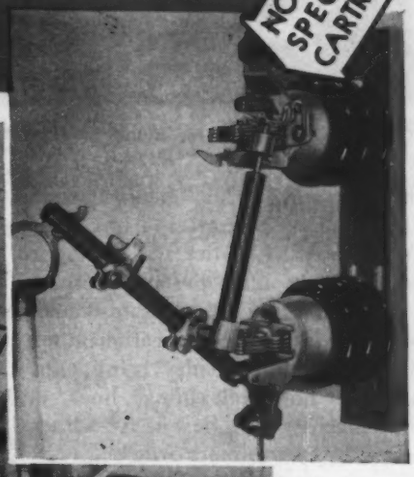
Hot Lines Tested by Hot-Stick Device

An instrument which can be applied to an energized line by means of hot-line sticks, if necessary, has been successfully put to use by Pacific Gas & Electric Company. Upon the request of P. G. & E. engineers, the details of the device were worked out by Chester Coon of the Safety Live Line Tool Company, Oakland, Calif. Although principal applications have been at lower-voltage distribution, it could be used effectively up to 11 kv. or more.

Several agencies have had a hand in the development. Fundamentally, it consists of a Lincoln maximum-demand meter, which is made up and furnished with a multi-range split-core current transformer by HD Electric Company. The attachments for use with hot sticks are put on by "Live Line" and the completed assembly is being furnished by L. A. Nott & Company, San Francisco.

There are two connections for hot sticks. One is a sleeve, bracketed to the chassis of the instrument, into which a stick may be inserted for

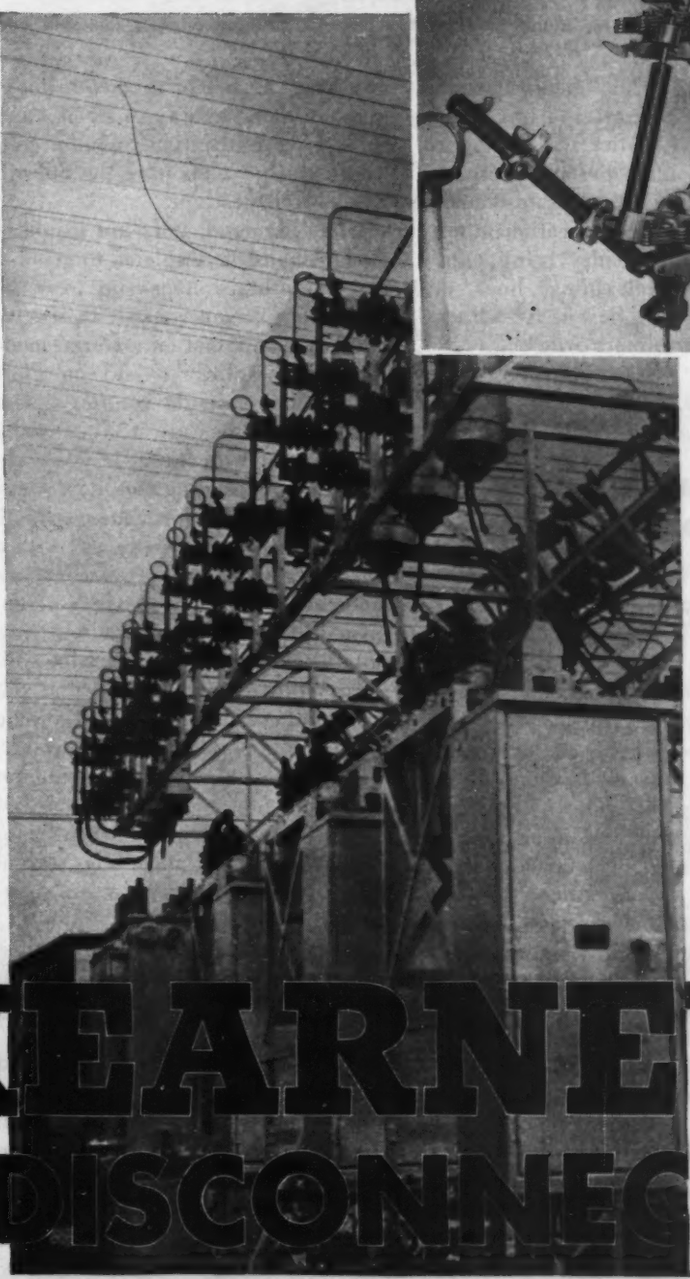
KEARNEY HOOK OPERATED
DISCONNECT
SWITCHES PROVIDE FLEXIBILITY IN POWER SYSTEMS



YOU need greater flexibility to provide for increasing loads of today and the future . . . And Kearney engineers have designed two classes of hook operated disconnect switches to meet your needs, along with an arc-extinguishing cartridge which operates in conjunction with several of the Kearney N. E. M. A. type disconnects. In the large illustration, notice the neat, compact installation of modern Kearney Switches. Although these switches come equipped with multi-point pressure contacts, station post insulators and tubular blades, they are also available, if specified, with shoe-type contacts, pin and cap insulators and truss-type blades.

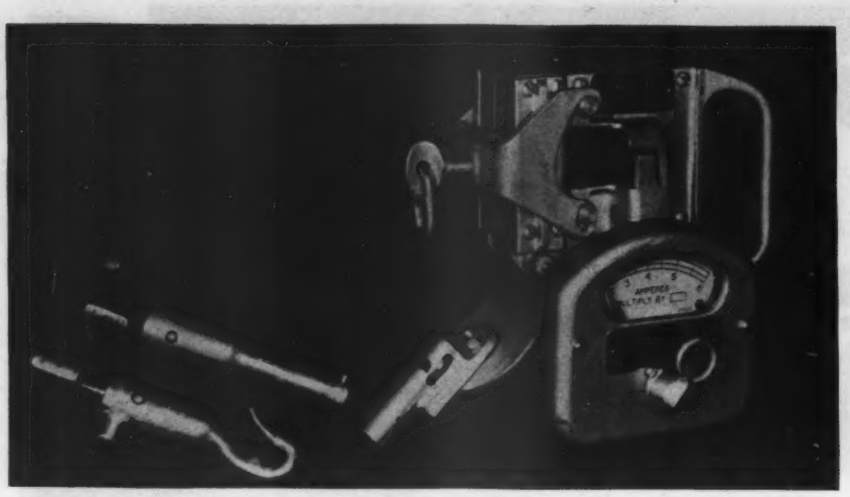
The small illustration shows the Kearney Arc-Extinguishing Cartridges designed to eliminate excessive arcing at the main contacts by temporarily providing a path for the line charging current while the main disconnect blade is being opened. This feature may be provided for Kearney N. E. M. A. type disconnects with ratings through 15,000 volts, 600 amperes and Sub-N. E. M. A. rated through 15,000 volts, 400 amperes.

If you are planning on obtaining greater flexibility in your system by the use of disconnect switches, acquaint yourself with the advantages which Kearney Disconnects provide to obtain efficiency in interrupting current.



Use **KEARNEY HOOK OPERATED DISCONNECTS**

MADE BY THE **JAMES R. KEARNEY CORPORATION**
4224-42 CLAYTON AVE. · ST. LOUIS, MO. · *Canadian Office*, TORONTO, CANADA



ONE STICK is used for lifting instrument, a second for manipulating the split core

holding and moving the instrument. The other is a screw and link which is operated by a stick with a hooked end to manipulate the split core.

P. G. & E. feels that the instrument offers a distinct simplification in testing procedure. Besides being applicable to hot, high-voltage lines, the instrument can be used without sticks in the ordinary way.

•

Glass Insulation Aids Motor Design

By JOHN S. ASKEY
Coil and Insulation Engineer, Transportation and Generator Engineering, Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

Glass-insulated conductors lend themselves readily to bending and forming — essential manufacturing operations—and also have an advantage in space factor over other materials. Designers find it possible to supply class "B" insulated coils in the space formerly required for class "A." Applications of glass-insulated conductors are limited, however, by the dielectric strength of the material; the designer finds it unwise to stress glass insulation higher electrically than he would cotton, silk or paper. Where insulation with higher dielectric strength is required mica is used. Conductors for stator coils of large high-voltage machines are laminated for reduction of eddy currents, and here, too, glass-insulated wire excels, with reduced space requirements and higher temperature resistance. Many coils have been built with glass-insulated strands or conductors for machines with ratings up to 16,500 kva., requiring as much as 5,600 lb. of glass-insulated wire for a set of stator coils. This application includes coils whose slot portions have the difficult Roebel transposition.

After the conductors are insulated the coils must be insulated to ground. For operating voltages up to 4,500 the slot insulation consists of several turns of a combination material made from mica splittings laid on glass cloth with a suitable bonding agent. The end windings are insulated with glass tape or with layers of mica and glass tape, depending on the voltage involved. Finally, for voltages up to 4,500, the entire coil is bound with a layer of glass tape. To overcome the inherent poor shear resistance of untreated glass tape impregnation in a suitable compound completes the coil.

For voltages above 4,500 the slot portion of coils is treated to eliminate corona. The end windings, however, still are subject to a certain amount of this reaction and glass has proved ideal as a protection against it. High-voltage machines, including several with ratings to 30,000 kva. and voltages to 23,800, have had their end windings similarly protected against corona. In addition, the moisture resistance of the end coils has been improved.

Many field coils of wire-wound construction, with double glass yarns as covering for the wire, have been placed in service. Because of the saving in space factor, such coils are compact and, when properly impregnated, are equal in mechanical strength to coils using other class "B" materials and superior to them in heat conductivity. The coil insulation to ground is glass or a combination of mica and glass, again depending on the operating voltage of the apparatus. Coils of this design have been used for machines with ratings up to 800 hp. and with speeds to 1,200 r.p.m., some coils weighing as much as 800 lb. per set.

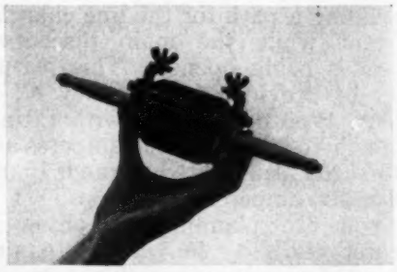
Glass tape also has been used for the taping of end windings of turbogenerator field coils because of its ability to stay in place when subjected to the high stresses encountered at rotor speeds of 3,600 r.p.m. Ratings of machines in service with this built-in rotor protection range from 1,000 to 3,500 kva.

•

Secondary Fuse on Strain Insulator

To expedite the installation of secondary fuses in line secondaries for paralleling distribution transformers the fuse device shown in the accompanying illustration has been developed and is being used by Public Service Company of Colorado.

Making use of the well-known porcelain strain type insulator and automatic wedge type dead-end sleeves, it can be cut into existing secondary lines in a very few minutes without the necessity of splicing on wire to cut in breakers or deadends.



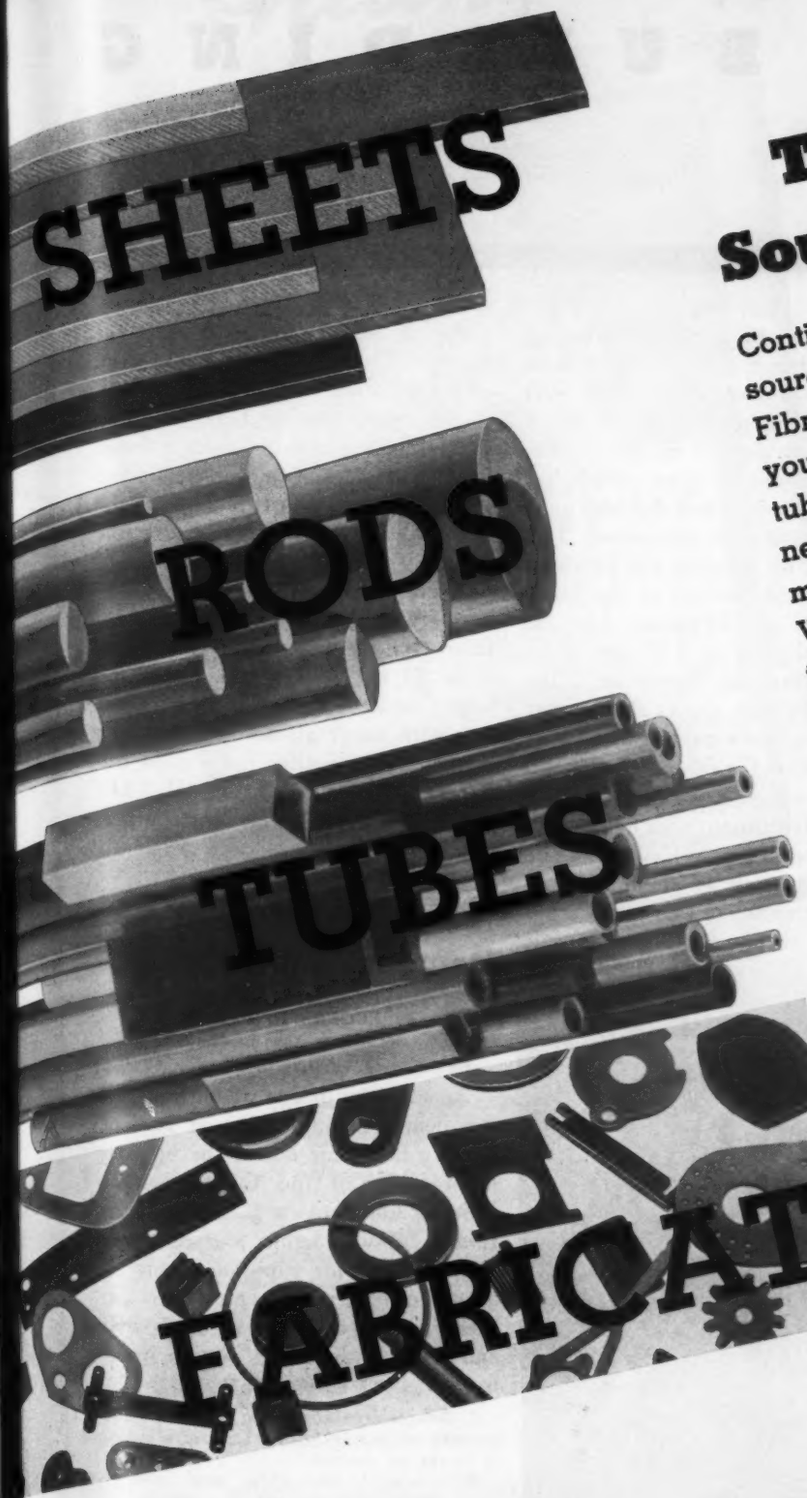
APPLICATION of appropriate terminals to a strain insulator makes splicing of extra wire unnecessary when fuses are cut into existing overhead lines

What it amounts to is a strain insulator to which has been added a pair of terminals, which are adaptable to fuse wire, to stamped alloy links or to various secondary links made with fibre tubes.

The device also finds use for breaking street lighting circuits at lamps, the lamp drops being attached to the terminals provided for the fuse links.

Developed by H. T. Hofer of the Public Service Company, the device is being manufactured by Electroline Company, Chicago.

DIAMOND FIBRE



The Logical Source of Supply

Continental-Diamond is your logical source of supply for Vulcanized Fibre Insulating materials, whether your requirements be sheets, rods, tubes or fabricated parts. Continental-Diamond facilities for the manufacture and fabrication of Vulcanized Fibre are unexcelled in the industry. Behind these facilities lies experience of almost a half century of manufacturing Vulcanized Fibre and related laminated insulating materials. The Continental-Diamond Laboratory has in its files case studies of thousands of Insulating problems and with this knowledge and experience stand ready to help you solve your specific problem.

CONTINENTAL-DIAMOND FIBRE CO., NEWARK, DEL.

DILECTO—A laminated plastic possessing unusual insulating and mechanical properties.

DIAMOND vulcanized **FIBRE**—A tough, hard, bone-like material of high dielectric strength.

CELLULAK — A specially laminated tubing with high dielectric strength and resistance to flashover.

VULCOID—A laminated fibrous base material highly resistant to atmospheric conditions and moisture.

MICABOND—Has all the good qualities of mica plus adaptability. Sheets, rings or formed parts.

CELORON—A molded phenolic fabric base material of exceptional mechanical strength yet very light in weight.

LOAD BUILDING

Luminous Hoods for Newspaper Presses

Supervised by Southern California Edison Company, proofreading tables, a linotpye machine and make-up stones in the composing room of the Alhambra, Calif., *Post Advocate* have illumination said to be an improvement over natural daylight. Luminous hoods installed over this equipment send down a light of even quality, completely free of shadow or glare, and enable pressmen to work more speedily and accurately.

From 30 to 60 ft.-candles of light were formerly provided by ten fixtures installed early in 1939. General room illumination also was increased to between 10 and 20 ft.-candles by the installation of twelve scientifically designed ceiling reflectors.

Developed by Willard Bausman, Edison lighting engineer at Alhambra, the luminous slant hoods were recently put in place, mounted under the 7-ft., 9-in. deck of the press. The brightness from the glass panels had to be of a low and well diffused quality. Glare had to be eliminated. This was solved by locating the hoods at both sides and exit end of the press. They have an 18x36-in. face of flashed opal glass on a 60 deg. slant. An insert from the top corner to the middle of the back makes a triangular reflector on the inside, with four sockets spaced for 60-watt lamps.

The flashed glass is clipped to the hood with felt lining, with hand poles at each end for relamping. The finish of the unit is aluminum lacquer. Five units are suspended from chains and six are bolted to the wall with an angle iron on top of the hoods. The hoods have a 6-ft. 5-in. clearance above the floor with a 2-ft. to 3-ft. 6-in. spacing between them. Placing of the units provides diffused light on all sides of the press cylinders and ink rolls. The two units at the exit end are 8 ft. 6 in. above the floor.

Average brightness is 190 foot-lamberts from the hoods, while the intensity of the press cylinders varies from 7½ to 18 ft.-candles. On the upper deck of the press four reflectors with cover glasses use 100-watt lamps. Two similar units light the paper rolls area. A total of 3,840 watts was added for this installation.

SHADOWS AND GLARE are eliminated in this newspaper pressroom with slant hoods of flashed opal glass

•

Infra-Red Demonstration Kit

By EUGENE R. D'OLIVE
Testing Department, Commonwealth Edison Company, Chicago

An effective design of portable kit for demonstrating infra-red radiant heating has come out of the lighting laboratories of the Commonwealth Edison Company. It consists of twelve 260-watt lamps and reflectors with fixtures for rapid assembly in a number of arrangements. This kit, shown, has a unit cost of about $90 and several advantages can be listed for it:

1. Adaptable—lamps can be assembled in units of four to form a bank or a string of lamps as desired.
2. Collapsible—assembles and knocks down easily with the aid of a few bolts.
3. Light and portable—a complete kit weighs about 25-30 lb. and can be carried about easily in a small car.
4. Neat and businesslike — creating a good impression on the prospect.

Basic element of the kit is a group of four 260-watt, 120-volt carbon filament infra-red lamps in 8⅜-in. pro-

Filling Empty Sockets!

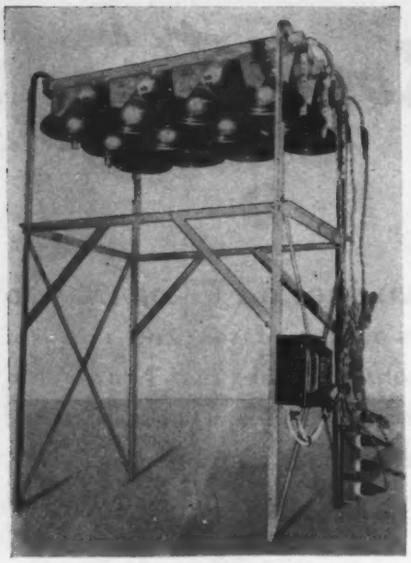
YOU ONLY GOTTA KNOW
2 THINGS ABOUT LAMP BULBS!
1 IS IT THE RIGHT SIZE? Small bulbs can hurt your eyes just like small shoes hurt your feet. Ask your G-E MAZDA lamp dealer!
2 IS IT MADE BY G-E? Why take anything else when G-E bulbs cost as little as a dime and even the 100 watt G-E MAZDA lamp is now down to 15¢
150 watt . . . 20¢ 100-200-300 watt . . . 60¢
G-E DIME LAMPS
Backed by G-E Research and marked . . . GE
7½, 15, 50, and 60 watts 10¢
G-E MAZDA LAMPS
Made to stay brighter longer
GENERAL ELECTRIC

THIS FULL PAGE G-E MAZDA LAMP AD appears in the March 2nd issue of the *Saturday Evening Post.* Notice how it sells the need for right-sized bulbs for easier seeing . . . and plugs the 100, 150 and 100-200-300 watt (3-lite) sizes.

NOTICE TOO how it ties in with the window display which will appear in 25,000 store windows during March. Tie-ins like this help fill empty sockets . . . sell Better Light for Better Sight.

THIS PERFECT TIE-IN IS TYPICAL of the G-E advertising and dealer promotion that is helping to make your customers more conscious of the need for more light and right sized bulbs than ever before. General Electric Company, Nela Park, Cleveland, Ohio.

G-E MAZDA LAMPS
GENERAL ELECTRIC



COMMONWEALTH EDISON uses fifteen of these portable demonstration kits to promote use of infra-red heating in industry. Basic element of kit is four-lamp unit assembled into lines or banks by bolting. Units are supported on adjustable legs

cessed aluminum reflectors mounted in line on regular wiring channel. Side braces extending to the rim of each reflector from the wiring channel keep the reflector axes in line and parallel. To facilitate grouping of the four lamp units either side by side, to form a bank, or end to end for use over a conveyor belt, individual units are provided at each end with an inverted U-shaped piece of $1\frac{1}{4}$ x $\frac{1}{2}$-in. steel channel, $8\frac{3}{8}$ in. between arms. These are drilled so that arms of adjacent four lamp units can be bolted together conveniently and quickly to form two or three unit groups. Short extensions, or legs, are provided for attachment to groups of one or more lamp units for convenience in mounting on production machines; these legs also provide means for adjusting the height of the lamps above the work.

Where the three units are assembled to form a bank of twelve lamps —three by four—a stand is provided that is equipped with a safety switch, extension cord and plug strip for attaching all lamp units to the load side of the switch conveniently. This stand provides a neat-appearing bank unit through which a conveyor belt can be run or, with the addition of a sheet metal plate, it can be used on stationary work. The legs mentioned above connect the stand with the assembled units of the bank and again provide height adjustment.

"World" Chart Promotes Power Sales

Operating costs today of an isolated plant are of deep concern to the owner, but how much of an increase in these costs must be faced in future is of deeper concern. To drive home the fact that the cost of purchased power declines over the years while the operating costs of isolated plants are increasing, Page Golsan, Jr., power engineer of New York State Gas & Electric, at Plattsburg, N. Y., sends customers the following letter accompanied by an up-to-date chart of trends in these costs. (For chart detail see ELECTRICAL WORLD, December 30, 1939, page 23.)

The letter follows:

You will probably be interested in the attached graph showing recent trends of cost factors relating to the production of electric energy. This graph brings out two very significant points:

First, it emphasizes the fact that production costs are never constant, but ever changing. Estimates based solely on today's prices will not prove out under tomorrow's prices, and every proposition must consider future prices as well as present. The wholesale price of Oklahoma fuel oil is more than double the 1932 price. Our large government debt calls for increased future taxes, and if inflation comes, as we've been promised, these trends will continue upward. Today's projects need to consider tomorrow's prices.

The second point is that, with all of these curves pointing upward, purchased power continues its downward trend, reaching consistently lower levels. What effect will these other rising prices have on the purchased power trend? Eventually they will have a bearing on the utility's cost of generation, but their effect on purchased power rates will be far less than the effect on the isolated plant. Many costs enter into utility rates and fuel costs represent only a small proportion. The fixed charges of transmission and distribution are a large part of the whole and remain constant. Hydro operation (almost entirely fixed charges) tends to stabilize costs. Constantly improving technique in large scale generation and better diversity of loads will serve to offset these increased fuel costs."

•

30 Ft.-Candles Speed Knitting Mill Output

The main knitting room of the Leicester (Mass.) Knitting Mills, Inc., at Rochdale, manufacturer of half a million dozen pairs of full-fashioned silk stockings annually, has been equipped with 152 300-watt prismatic type lamps mounted 7.5 ft. above the floor and spaced 7.5 ft. along each aisle, the aisles being 13 ft. on centers. The room is 250 ft. long x 82 ft. wide and the intensity of illumination ranges from 25 to 30 ft.-candles at the knitting point. The lamps are special industrial asymmetric units, designed to illuminate the focal parts of the machines with maximum intensity. The installation is of much assistance in maintenance, since the production units are so complex that four weeks are required for assembly of the thousands of parts involved in each machine. Reduced eyestrain contributes to increased production and lessened damage to material processed.

ONE HUNDRED AND FIFTY-TWO 30-watt lamps supply 20 to 30 ft.-candles in this Massachusetts knitting mill

WHEN 340 TONS OF LOCOMOTIVE ARE FIGURED IN INCHES

AS long as "she" looks like the real thing, that's satisfaction enough for some amateur designers of model trains. Building a precise scale model that not only looks the part but, at the flick of a switch, plays it—takes experience.

It's easy, too, to design capacitors for power-factor improvement that may look like the real thing. But to build into a capacitor lasting dependability . . . time-defying peak performance — that takes long experience.

Cornell-Dubilier has built, and specialized in the building of capacitors for more than thirty years. Learn how today's C-D capacitors for power-factor improvement can save you important money . . . how quickly they release system capacity . . . how reliably they operate. Get the facts, and you, too, will specify the capacitor experience built.

There is no substitute for experience.

Our trained engineers will be glad to go over your system capacity and voltage problems with you. Write direct to Cornell-Dubilier Electric Corporation, South Plainfield, New Jersey. Canadian representative — English Electric Company of Canada, Ltd., St. Catherine, Ontario.

LOOK

at these **C-D** features

- Impregnated and filled with non-inflammable, non-explosive Dykanol.
- Heavy-duty, two petticoat, fog-type bushings.
- Durable arc welded, leak proof, copper bearing steel case protected by double coat of weatherproof paint.
- Large number of small capacitor windings, each impressed with a low potential.
- Low loss high quality capacitor tissue used.
- Large factor of safety in design.

There are more

CORNELL-DUBILIER CAPACITORS

in use today than any other make*

* Including all applications.

CORNELL-DUBILIER CAPACITORS

CORNELL-DUBILIER

Capacitors for Power-Factor Correction

NEW EQUIPMENT

Distribution Transformer

Cadmium plated three-way terminals allow leads to enter the terminal from any one of three directions. Installation can be made with ordinary tools carried by a lineman; the tightening tool, always traveling in an up-and-down direction, because of the construction of the three-way terminal, prevents any accidental short circuit across the secondary terminals. Double conductor insulation is used. High-voltage bushings have curved shanks to prevent internal flashover and are protected by an overhanging pocket. Both high- and low-voltage bushings have been designed to eliminate radio interference.

New distribution transformer; available in all standard N.E.M.A. ratings. **Allis-Chalmers Mfg. Co.**, Pittsburgh, Pa.

•

Solder Wire

"Meritas" solder wire on spools of 10 lb. **Meritas Commercial Co.**, 11 Water St., New York, N. Y.

Made of tin and lead, it is said to be particularly advantageous to the electrical industry because of the neutral flux. Claimed to be non-corrosive and have good binding strength.

•

Tool Bag

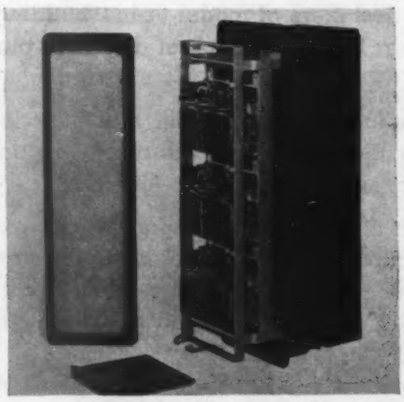
No metal parts are used in the manufacture, thus eliminating danger of contact with live wires or current-carrying equipment. The bag is made of heavy-weight hard-woven canvas and a specially designed, flexible, waterproof leather bottom. The large rope loop is for use as a handle, the smaller one at side for putting over pin.

Style L linemen's insulated tool bag for hoisting tools, insulators and supplies; size 12-in. diameter and 15-in. depth. **Industrial Products Co.**, Philadelphia, Pa.

•

Drawout Relay

This new relay consists essentially of three parts: (1) A case which can be mounted and wired permanently; (2) a self-supporting cradle that carries the relay elements and their terminals and (3) a connecting plug that makes positive silver contact between the relay terminals and the studs in the case. To draw out the cradle, remove the cover and withdraw connecting plug. This opens the trip circuit, short circuits the current transformers and disconnects the potential transformers. This relay is built to supplement the removable circuit breakers in metal-clad switchgear.



"Drawout" relay, type IAC-11-B1, combines in one unit relay and testing devices. **General Electric Co.**, Scehenectady, N. Y.

FIND IT IN A HURRY—If you're buying major electrical equipment, you'll find names, addresses and products of leading manufacturers conveniently listed in "Electrical World" *Electrical Buyers Reference.*

Test Set

The Fluortest is for demonstrating and testing separately or in combination fluorescent lamps, starting switches and all control apparatus now available for general commercial use—auxiliaries, ballasts, choke coils, compensators, reactors, etc. It may be used for checking completed installations and fixture assemblies in wired circuits, without risk to lamps or other equipment; detecting and analyzing causes of trouble. The Fluortest Junior is for testing completed installations and fixtures assemblies in wired circuits only. Primarily for the use of wiremen and servicemen. For testing lamps and control units not in wired circuits Flourtest must be connected to 110-120-volt, 60-cycle a.c.; on wired circuits the two test sets can be used on 110-120- and 220-240-volt circuits, a.c. or d.c.

"Fluortest" instruments for testing fluorescent installations. **Zephyr-Lite Mfg. Co.**, 169 North Racine Ave., Chicago, Ill.

•

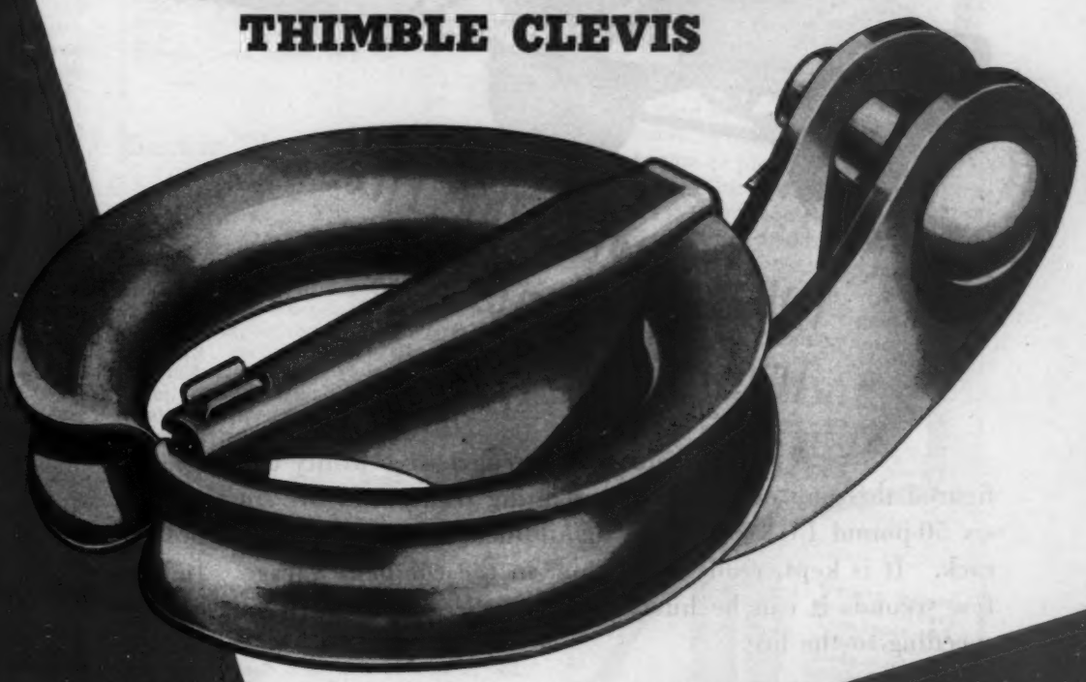
Slot Insulation

"Varslot," slot insulation available in either sheets or continuous length rolls, in tape or strip form. **New Jersey Wood Finishing Co., Inc.**, Woodbridge, N. J.

"Varslot" is made from rag paper combined with black bias varnished cambric, using a binder and process, whereby the company claims that both flexibility and adhesion may be obtained. Features claimed are that its tearing strength is improved, thus preventing shorts at the end of the slots; it does not buckle when placed in the slot and the dielectric

Again Hubbard Leads the Field!

THE NEW OPEN SIDE THIMBLE CLEVIS



Smoothly Galvanized—Cannot injure Conductor

. . . . Strong—Light Weight—Easy to Install

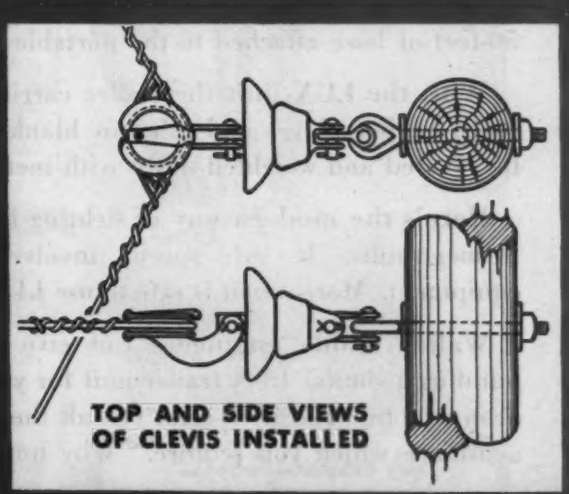
. . . Open Side Eliminates Threading Difficulties

. . . . . For Angles up to Sixty Degrees

Thimble 3¼-inch Diam.—Wire Groove ¾-inch

. . . . Lines may be Tied-in on Pole or Ground

. . . Attachment Bolt is ½ or ⅝-inch Diameter



TOP AND SIDE VIEWS OF CLEVIS INSTALLED

HUBBARD AND COMPANY

PITTSBURGH . . . OAKLAND CALIFORNIA . . . CHICAGO

"HANG THE LOAD ON HUBBARD HARDWARE"

QUICK ACTION...

For Extinguishing Fires in Transformer Vaults

● One of our more progressive utility companies figured this one out. This fire-fighting trailer consists simply of six 50-pound LUX cylinders, manifolded, and attached to a hose rack. It is kept, ready for action, in the company garage. In a few seconds it can be hitched to a service truck and under way speeding to the fire.

A number of the company's underground vaults are equipped with built-in LUX Shielded Nozzle systems. Thus a 25-foot length of hose on the trailer can be quick-coupled from the LUX carbon dioxide cylinders directly into the vault. If manhole or unpiped vault fires are to be controlled there is a separate attachment with 50-feet of hose attached to the portable nozzle.

With the LUX unit the trailer carries its own complete set of tools, rubber gloves and asbestos blankets. Ventilators can thus be covered and weighted down with metal plates.

Here's the modern way of fighting fires in underground transformer vaults. It's safe, speedy, involves no damage from wetting equipment. Moreover it is safe to use LUX on energized apparatus.

Walter Kidde engineers can give you complete details on building a similar LUX trailer unit for your own company. Simply drop us a line and we'll send you all the information, give you the assistance which you require. Why not write today?

Walter Kidde & Company, Inc.

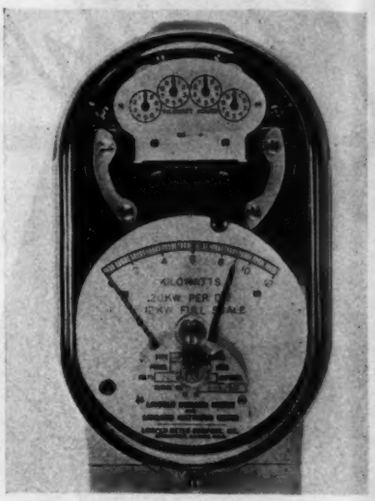
328 West Street, Bloomfield, N. J.

strength after bending or shaping is the same as in its original form; it can be cut, slit or punched for application and that it may be stored without deterioration.

•

Watt-hour-Demand Meter

The unit is housed in a polyphase type case. A type HF Sangamo meter is mounted in the upper part, while a Lincoln type



Watt-hour-demand meter, type WDE, consisting of a single-phase watt-hour meter and a maximum-demand meter. **Sangamo Electric Co.**, Springfield, Ill.

WD thermal demand meter is located in the lower part of the base, with a single glass cover inclosing both meters.

•

Box Switch Line

New Textolite box switch line, single-pole, double-pole, three-way, and four-way types. **General Electric Co.**, Bridgeport, Conn.

This new line of switches has a "T" rating for type C loads. The blades are anchored in Textolite blade carriers, making for high dielectric strength and permanent alignment, the company claims. A compression-type spring is used for increased strength and durability.

•

Meter Inclosure

Duplex, triplex and quadruplex meter inclosures for outdoor or indoor installations, No. 9194E-5. Corcoran-Brown Lamp Division of **Auto-Lite Company**, 4900 Spring Grove Avenue, Cincinnati, Ohio.

Made of "Galvanealed" steel, these cabinets are designed to accommodate single-phase bottom-connected meters. Cabinets are equipped with side rails on cover and with top coupling. Knockouts can be substituted for coupling.

•

Vibration Isolator

Controlled spring isolator; light duty for loads from 60 to 190 lb. per isolator, and heavy duty, for loads from 250 to 720 lb. Loaded dimensions are 6 x 6 x 3¼ in. **Johns-Manville**, 22 East 40th St., New York, N. Y.

Developed for use on the bases of motors, generators, pumps, ventilating fans, where vibration and excessive motion create noise

and tend to wear out machine parts and damage connections. The working parts consist of a coil spring and a rubber load pad, which support the equipment and isolate vibration, and an adjustable rubber snubber inside the base to control excessive motion. The isolator was built to take care of horizontal and torsional as well as vertical vibration, states the company.

•

Drying Lamps

Infra-red drying lamps, 250-, 500- and 1,000-watt sizes for industrial or commercial drying and heating jobs. **General Electric Co.**, Nela Park, Cleveland, and **Westinghouse Electric & Mfg. Co.**, Bloomfield, N. J.

A 250-watt unit, the 500-watt unit and 1,000-watt unit should be used in conjunction with specially designed reflector equipment; the other 250-watt unit has its own reflector "built into" the bulb. Designed for use on 105- to 120-volt circuits. Rated laboratory life of all the four lamps is said to be in excess of 5,000 hours.

•

Heavy-Duty Contactor

Two new features are prevalent in this line of electric motor control. A new, high efficiency type arc blow-out quickly drives the arc from the contacts to the large arc horns above the contacts. It is

540 line of d.c. heavy-duty contactors, available in 100, 150, 300, 600, 1,200 and 1,800 amp. sizes. **Cutler-Hammer, Inc.**, Milwaukee, Wis.

claimed that this instantaneous rupturing of the arc on the arc horns, instead of on the contacts, greatly prolongs contact life. The second new characteristic is the dust-safe, vertical-contact construction, claimed to eliminate contact troubles.

•

Fence Accessories

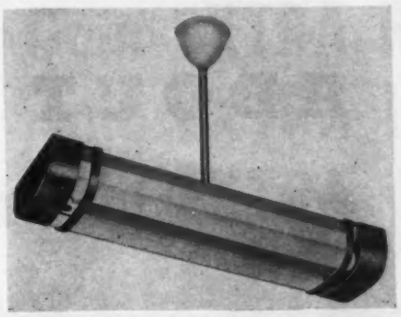
Accessories for electric fence systems. **Accessories Mfg. Co.**, 4612 N. Clark St., Chicago, Ill.

This equipment consists of "Kwik Klip" for fastening fence wire to insulators, utility tester, "Twistite" for fastening insulators to any standard steel fence post, gate handle, electric fence lightning arrester, "8-point" ground clamp, electric fence lightning arrester kit, warning signs and connector clamps.

•

Fluorescent Fixture

Known as the "matched unit," it comes with stem and canopy assembled and wired with auxiliaries. Corrected power factor and stroboscopic effect claimed. Only two wires to power supply. For commercial and industrial use, especially in air-conditioned buildings.



C-50 "Miralume" with two 20-watt fluorescent lamps (daylight or white); over-all length 25 in., width 9 in. and height 3½ in. **Hygrade Sylvania Corp.**, Salem, Mass.

•

Electric Glue Pots

Automatic, dry type, electric glue pot, rated at 250 watts and operated at 115 or 230 volts. **Westinghouse Electric & Mfg. Co.**, Mansfield, Ohio.

Featuring a snap action thermostat which maintains a temperature of between 150 and 160 deg. F, only 30 to 50 minutes will be required to heat a full two-quart container to 150 deg. F. The removable glue container is approximately 7⅞ in. in diameter and 9 in. high. Heavy insulation between the inner and outer vessel prevents heat loss and increases efficiency, it is claimed, and mica insulation protects the nickel-chromium heating element from the outer wall.

•

TECHNICAL LITERATURE

DECIMAL EQUIVALENTS—Decimal equivalents in average wall and minimum wall (equivalent average) for fractional inches and Birmingham wire gauge are available on a handy letter-size card from the Babcock & Wilcox Tube Company, Beaver Falls, Pa., by specifying Technical Data Card No. 3.

AMERICAN STANDARD—Specifications for heavy-walled enameled round copper magnet wire; seven pages containing introduction which gives history of project, plan of development and application of standards; text describes scope, wire, manufacture, properties and tests aided by tables. Bulletin C8.20 of the American Engineering and Industrial Standards.

REPAINTING TRANSFORMERS IN THE FIELD—Discussed in this bulletin are the surface preparation, method of applying paint, number of coats required, materials recommended for repainting outdoor transformers, and repainting underground equipment. Copies may be obtained from the General Electric Co., Schenectady, N. Y., by specifying Bulletin GET-677B.

STANDARDS—Specifications for weather-resistant saturants and finishes for aerial rubber-insulated wire and cable. Gives standards for fibrous covering, saturant, finish, mineral filler, acceptance tests and inspection. A table gives the factors for determining mandrel diameter, bending test. An eight-page pamphlet available from American Standards Association, 29 West 39th St., New York, N. Y.

The SPOON that is
Solid Steel
in the Solar Plexus
The one spot where fighters can't take it is the solar plexus—the one spot where a spoon or shovel must take it is the shank and where the blade joins it. The blade, shank and ferrule of Sturd-E Solid Shank Spoons are forged all in one piece from a solid bar of steel—no welds, seams or pieced together joints. This is the strongest construction known to shovel makers. To add yet more utility, the heavy 13-gauge blade is heat treated. Specify Sturd-E Spoons for longer service life, greater value.
STURD E TOOLS
a TRUE TEMPER PRODUCT
Western pattern Sturd-E Heavy Duty Spoon with solid steel shank. Blade, shank and ferrule forged in one piece from a solid bar of steel. 13-gauge blade, heat treated with XX grade hickory or ash handle, sanded and waxed, in lengths from 6 ft. to 12 ft.
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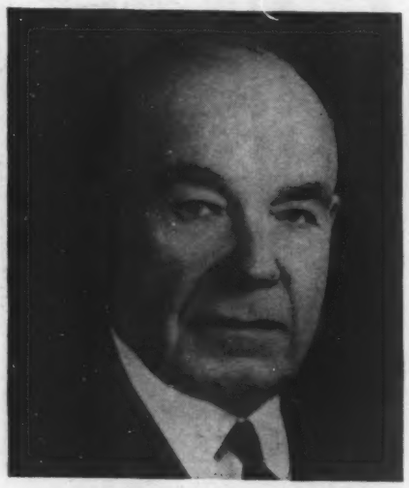
NEWS ABOUT PEOPLE

Hughes New Chairman; Byler Hotpoint President

George A. Hughes, who was recently elected chairman of the board of the Edison General Electric Appliance Co. of Chicago, is known throughout the electrical industry as the "father of the electric range." He has been president of the company since its organization. In his new position he will continue to be active in the business, maintaining his present headquarters in the Hotpoint company's offices in Chicago.

After operating electric utility properties in Montana and the Dakotas, he went to Chicago in 1910, and it was in that city that he formed the Hughes Electric Heating Co., which made and sold the Hughes electric range. The present organization was formed in 1918 with Mr. Hughes as president.



G. A. Hughes

Just prior to his election as chairman of the board of the Hotpoint company Mr. Hughes was honored as a modern pioneer by the National Association of Manufacturers, for his contributions to the advancement of American industry and American living standards, through his electric heating unit and electric range inventions.

A. D. Byler

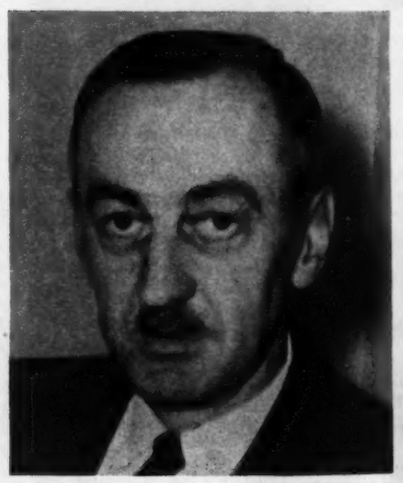
A. D. Byler, for sixteen years vice-president and general manager, succeeds to the office of president of the Hotpoint company. Mr. Byler obtained his formal engineering training with the Commonwealth Edison Co., Chicago, finally becoming superintendent of shops. In 1920 Mr. Byler joined the Hotpoint company as industrial engineer. Since then he has occupied, successively, the positions of superintendent of the Taylor Street plant, Chicago Works manager, and general works manager. In 1924 he was elected vice-president and general manager, holding this position to the present time. As president of the Hotpoint company Mr. Byler will continue to direct manufacturing and engineering operations in addition to his other duties.

R. W. Turnbull, who has been vice-president in charge of sales for the Hotpoint company, now becomes first vice-president. One of the best-known men in electric appliance merchandising, Mr. Turnbull began his appliance career in 1910 as a salesman for the Southern California Edison Co. The following year he joined the Pacific Electric Heating Co., Ontario, Calif. When the present Hotpoint organization was formed, in 1918, he became sales representative for the Pacific Northwest, and in 1924 he was made Pacific Coast district manager. In 1931 he was appointed vice-president in charge of sales, the position he held up to the present time, except for a brief period with the General Electric Co. in Bridgeport. In his position as first vice-president Mr. Turnbull will continue to direct sales activities for the company.

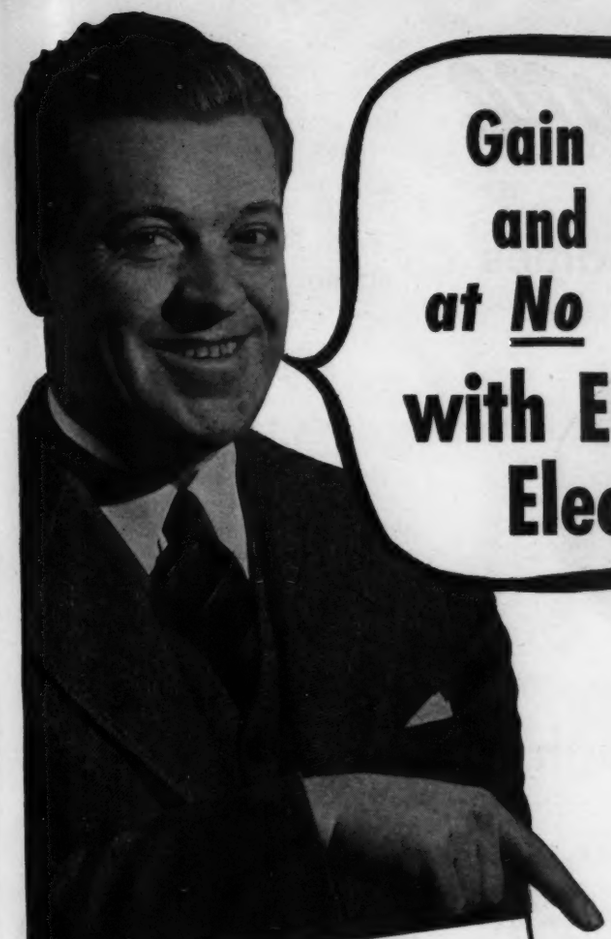
•

B. S. Gramley Assumes New Duties in Long Island

At a recent meeting of the directors of the Long Island Lighting Co. Bruce S. Gramley was elected a vice-president. Mr. Gramley has been with the company for 29 years and is at the present time its purchasing agent. A native of Pennsylvania and a graduate of Pennsylvania State College, he spent a year with the General Electric Co. in Schenectady. He went from there to the Public Service Co. of Northern Illinois, where he remained two years.



In 1911, shortly after the Long Island Lighting Co. had been formed, he became associated with that utility and has been with it ever since. He was instrumental in the formation and organiza-



Gain EXTRA Revenue... and EXTRA Load... at *No* EXTRA *Cost to You!* with EDISON-HOTPOINT Electric Fry Kettles

BUILD *extra* load and revenue by promoting Edison-Hotpoint Electric Fry Kettles to restaurants, taverns, tea rooms and coffee shops.

One Fry Kettle uses up to 7500 kilowatt hours yearly and produces as much as $180.00 in revenue.

This Edison-Hotpoint Electric Fry Kettle helps you make friends too. Besides producing superior fried foods, it saves money for your customers—as much as three times the cost of the kettle each year—on fat savings alone.

EDISON GENERAL ELECTRIC APPLIANCE CO., Inc., 5618 W. Taylor St., Chicago

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Let Edison-Hotpoint Electric Fry Kettles make friends for you. Write today for our Round-Up Sales Plan.

ACCURATE TEMPERATURE CONTROL
Insures perfect fried foods with a minimum of watching. Holds proper frying temperatures under load.

Counter Kettle with Stand. For use where counter space is not available.

For the Range Bank. Compact. Durable.

For the Counter or Back Bar.

For sale through Kitchen Equipment Houses

COMMERCIAL ELECTRIC EDISON Hotpoint **COOKING EQUIPMENT**

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. . . built to stand up through years of hard use

When you select Western Electric Radio Telephone for your maintenance trucks, you are certain of dependable service for years to come. It is designed by the world's leading communication engineers—Bell Telephone Laboratories. It is manufactured by the makers of Bell telephones—with long experience in meeting the varied radio needs of airlines, police, ships-at-sea, broadcasters.

You can get Western Electric equipment to meet your emergency communication requirements—whether you serve compact territory or run cross country lines.

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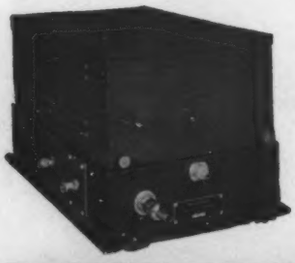
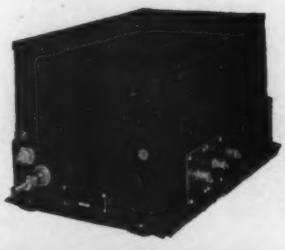
Dependable equipment for long range service



28A superheterodyne crystal controlled mobile receiver—offers clear reception even in poorest areas.

28A high powered crystal controlled 100% modulated mobile transmitter.



Western Electric
RADIO TELEPHONE EQUIPMENT

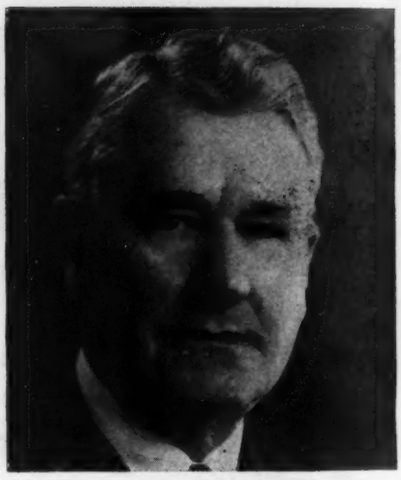
tion of its purchasing department and as the company grew his responsibilities increased in his capacity as purchasing agent both for the company itself and its subsidiaries.

•

Sierra Pacific Elects Lemmon Operating Head

H. A. Lemmon has been elected vice-president and general manager of the Sierra Pacific Power Co., Reno, Nev., succeeding the late George A. Campbell as operating head. Born in Sierra Valley among the California Mother Lode mining camps in 1873, Mr. Lemmon left school when he was 14, going to San Francisco, where he learned the printing trade. He spent some years in the publishing field before entering the utility industry.

His first association in the utility business was with the late Frank G.



Baum, noted hydro-electric engineer, for whom he acted as Nevada representative. In 1907 Mr. Lemmon became agent for the Nevada-California Electric Power Co., one of the predecessors of Sierra Pacific Power. From 1909 to 1914 he was Carson City agent for the Truckee River General Electric Co., moving to Reno in the latter year as assistant to the manager.

In 1919 the Stone & Webster organization moved him to Halifax, Nova Scotia, as sales manager of the power company there. In 1920 he was called to Boston to act as personnel manager for all Stone & Webster utilities. In the next eleven years he traveled over all of the Stone & Webster properties. After a short period of ill health, he returned to Reno in 1931 as sales manager of the Sierra Pacific Power Co. He was elected a vice-president three years ago. While sales manager he developed the highly successful "Reno" or "Lemmon" plan of dealer co-operative merchandising, which has since been widely copied.

Cut Installation Costs . . .

Rapid installation features every job where Transite Ducts are used. Their long, light lengths make handling easy and economical. Lining-up is fast and accurate . . . fewer joints are required. Their smooth bore *stays* smooth . . . assures easy cable pulls on new lines or replacements. And Transite Conduit needs no protective casing . . . saves the entire cost of concrete.

Prevent Smoke and Fire Losses . . .

Made of asbestos and cement, Transite Ducts can't burn or give off smoke or fumes. They resist flame and arc . . . prevent burnouts from damaging adjacent equipment. After burnouts, ducts are easily cleaned . . . cables readily removed and replaced.

End High Maintenance . . .

No service is too tough for Transite Ducts. Their unusual corrosion resistance keeps upkeep low. And because Transite Ducts have an unusually high rate of heat dissipation, I^2R losses are reduced . . . cables have higher carrying capacity, longer life.

For complete details on J-M Transite Conduit and Transite Korduct, write for brochure DS-410. Johns-Manville, 22 East 40th Street, New York, N.Y.

Specify

Johns-Manville TRANSITE DUCTS

TRANSITE CONDUIT for use underground without a concrete envelope and for exposed locations.

TRANSITE KORDUCT for installation in concrete. Thinner walled, lower priced, but otherwise identical with Transite Conduit.

Sil-Fos

BRAZING gives the final touch to Tap-Cable connections!

ONE large company has taken all uncertainty out of joining taps to cables and added the final touch of **reliability** by using special "stub" connections and brazing them with the low temperature alloy SIL-FOS.

Exceptionally free flowing SIL-FOS penetrates **into** the cable, solidifies the wires at the joint and produces joints high in strength, low in resistance and cool in operation.

SIL-FOS does work like this at surprisingly low cost. It saves time and material on all kinds of electrical applications. Millions of joints are made annually with it on electrical production jobs and maintenance and repair work.

Have you tried SIL-FOS on your work? We will gladly show you what it will do. Write us for full details and Bulletin 53-EW.

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H. B. Waters New President of Utah Utility Company

Herman B. Waters was recently named president of the Telluride Power Co., Salt Lake City, Utah. He fills the vacancy created when former president Paul N. Nunn died in San Diego, Calif., last October.

Mr. Waters has been with the Telluride company for nearly 30 years and was chief engineer of the Idaho Power & Light Co. before the Telluride company sold that unit to Idaho Power Company.

Paul P. Ashworth has been appointed assistant general manager. Well known for his work with the Northwest Electric Light & Power Association, and through prior association with the Utah Power & Light Co., he joined the Telluride organization eighteen months ago.

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▶ DR. THOMAS H. HOGG, chairman and chief engineer of the Ontario Hydro-Electric Power Commission, was recently elected president of the Engineering Institute of Canada.

▶ ROBERT E. CARROLL has been elected a vice-president of the Arrow-Hart & Hegeman Electric Co., Hartford, Conn. He joined the organization about thirteen years ago.

▶ CHARLES G. PYLE, sales manager of the Hygrade lamp division, Hygrade Sylvania Corp., with headquarters in Chicago, has recently established his headquarters at the New York office of the company, located at 500 Fifth Avenue.

▶ JAMES I. METCALF, New York power consultant, who has been acting chief of the system planning and markets division of the Bonneville project, will complete his work for the Bonneville administration April 1 and return to the East. Mr. Metcalf was formerly connected with the New York Power Authority for several years.

▶ EDMOND S. MCCONNELL has returned to Anaconda Wire & Cable Co., Hastings-on-Hudson, New York, as electrical engineer after a leave of absence with the Copper Wire Engineering Association, Washington, D. C., where for the past two years he has directed field engineering service for the association in 27 eastern and southern states, especially in connection with the rural distribution projects sponsored by the Rural Electrification Administration. For a year previously he was in charge of the preparation of the Copper Wire Engineering Association sag and tension charts for overhead copper conductors, which have since become standard for the industry. Earlier in his career he was connected with the Chicago, Milwaukee & St. Paul Railroad and the American Brass Co., Waterbury, Conn. In 1929 he went to Chicago as district engineer for Anaconda Wire & Cable Co. In 1935 he was transferred to Hastings-on-Hudson as electrical engineer. Mr. McConnell is a member of the American Institute of Electrical Engineers and also of the Washington Society of Engineers.

OBITUARY

▶ ISAAC B. LUCAS, formerly Attorney-General of Ontario and one-time Provincial Treasurer, died at his home in Toronto on March 8. He was 73 years of age. For 20 years Mr. Lucas was connected with the Ontario Hydro-Electric Power Commission.

▶ S. B. BOND, secretary-treasurer of the Bathurst Power & Paper Co., Bathurst, N.B., Canada, died at his home in that city on March 7. He aided the late Angus McLean in founding the combination hydro power and paper production business in 1915.

▶ MRS. JEANETTE I. REES, chairman of Southern California Edison Co.'s women's committee, died March 10, following an extended illness. Mrs. Rees joined the company in 1910, and in 1928 founded the Edison women's committee, an organization of training and service for women employees. Beginning with a group in the general office in Los Angeles, the organization was extended under Mrs. Rees' direction to include every part of the Edison system.

▶ BUEL B. BLAKE, manager of the Westinghouse Electric & Manufacturing Co., Seattle, since 1937, died at his home in that city on March 7, following an illness of several months' duration. He was 42 years of age. Mr. Blake entered the employ of the Westinghouse company at East Pittsburgh, Pa., in 1920. A year later he was transferred to the engineering force of the Seattle office and served continuously with the organization, becoming manager upon the retirement of Walter D. McDonald.

▶ ALFRED L. HARRINGTON, chief electrical engineer, Pittsburgh Plate Glass Co., Pittsburgh, Pa., died November 15. Early in his career Mr. Harrington was connected with the General Electric Co. Later he became electrical superintendent for the Carolina Power & Light Co., Raleigh, N. C., and superintendent of electrical construction for the Phenix Utility Co., Hartsville, S. C. In 1919 he took the position with the Pittsburgh Plate Glass Co., which he held until his death.

You can install it *near the load*..

If you use AMER-TRAN ABESTOL* TRANSFORMERS

Restrictions covering oil-immersed equipment do not apply

Fire-proof

Installation Costs Reduced

Underwriters' Laboratories Listed

Greater Convenience

Improved Appearance

No Fireproof Vault Required

Abestol Transformers provide an economical solution to many power problems. These units have all the features and advantages of oil-immersed equipment, yet they are suitable for indoor installation with many restrictions removed. Use of this modern type of apparatus frequently makes possible substantial reductions in both installation and operating costs . . . fireproof vaults are unnecessary . . . transformers are located close to the load . . . expensive secondary cable costs are reduced . . . efficiency, performance and appearance are improved . . . safety is unimpaired.

- **Made in all standard distribution and power ratings, Abestol Transformers are available for every requirement. Let us submit information on equipment for your needs.**

★ABESTOL is a non-inflammable, non-explosive insulating fluid used in place of transformer oil in especially designed equipment. Use of Abestol is licensed under the Pyranol Patents of the General Electric Company.

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178 EMMET ST. NEWARK, N. J.

Manufactured Since 1901 at Newark, N. J.

MANUFACTURING - MARKETS

Net Increase Shown for Allis-Chalmers

Net profit of Allis-Chalmers Manufacturing Co. for 1939 after all charges totaled $3,719,546, or $2.09 a share on the outstanding common stock. This compares with $2,553,946, or $1.44 a share in 1938.

Otto H. Falk, chairman, and Max W. Babb, president, stated in the annual report to stockholders that the increase in net earnings, with lower billings, was attributable to various factors, including a greater uniformity of operations throughout the year and a large amount of work in process which had not been completed and billed at the end of the year.

Orders booked during the year totaled $83,658,734 and sales totaled $74,339,551. Unfilled orders at the end of 1939 totaled $19,730,594. Inventories were $30,335,005, against $25,301,884 at the end of 1938. Current and working assets amounted to $66,301,838, including cash of $10,498,308. The report stated that the increase in inventories was due principally to the substantial increase in unfilled orders at the end of the year, which included contract orders nearing completion but not billed, and also a stock of standard types of tractors manufactured in anticipation of sales for spring delivery.

The report stated that the company's purchase commitments of materials for future delivery are considered not in excess of current production requirements. At the close of the year the company had 14,456 employees, against 11,511 at the end of 1938. The outlook was believed to be favorable for business.

•

Westinghouse Will Pay Bonus of 8% in March

Wages and salaries of employees of Westinghouse Electric & Manufacturing Co. will be adjusted upward 8 per cent from base rates in March, as against 10 per cent in February, based on average earnings in the preceding three months. Approximately 49,500 employees will share in the increase.

Net profit for the three months ended February 29, 1940, was $3,833,564, of which $1,598,595 was earned in December, $958,738 in January and $1,276,231 in February.

Orders for four turbine-generator units with combined rating of 150,000 kw., representing an investment of about $3,000,000, have been received. The orders include 35,000 kw. for Ohio Edison, 35,000 kw. for Central Illinois Light, 40,000 kw. for Alabama Power and 40,000 kw. for Georgia Power.

•

Plans Stock Conversion

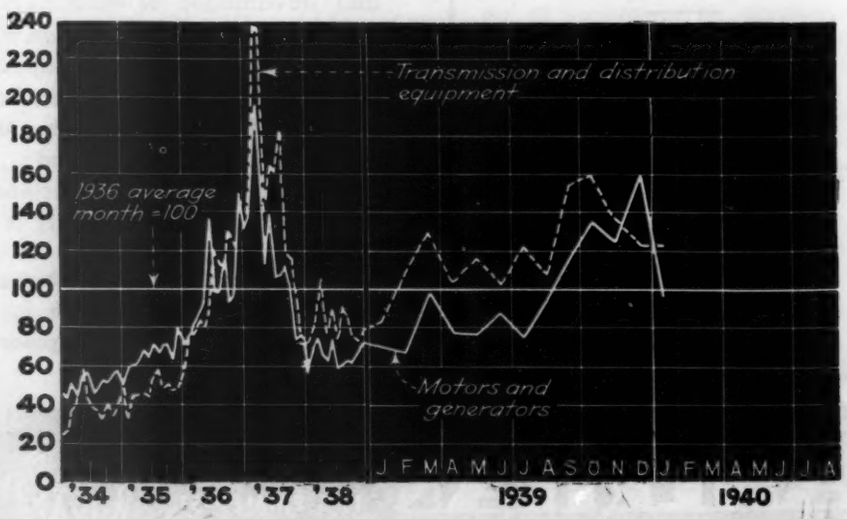
Directors of the Weston Electrical Instrument Corp. have decided to convert the no-par value common stock into common stock of $12.50 par value and will submit the proposal to the shareholders at the annual meeting on April 15. This will decrease the capital of the company from $2,500,000 to $2,050,000 and create a capital surplus of $45,000.

NEMA Index Records Decrease in Orders

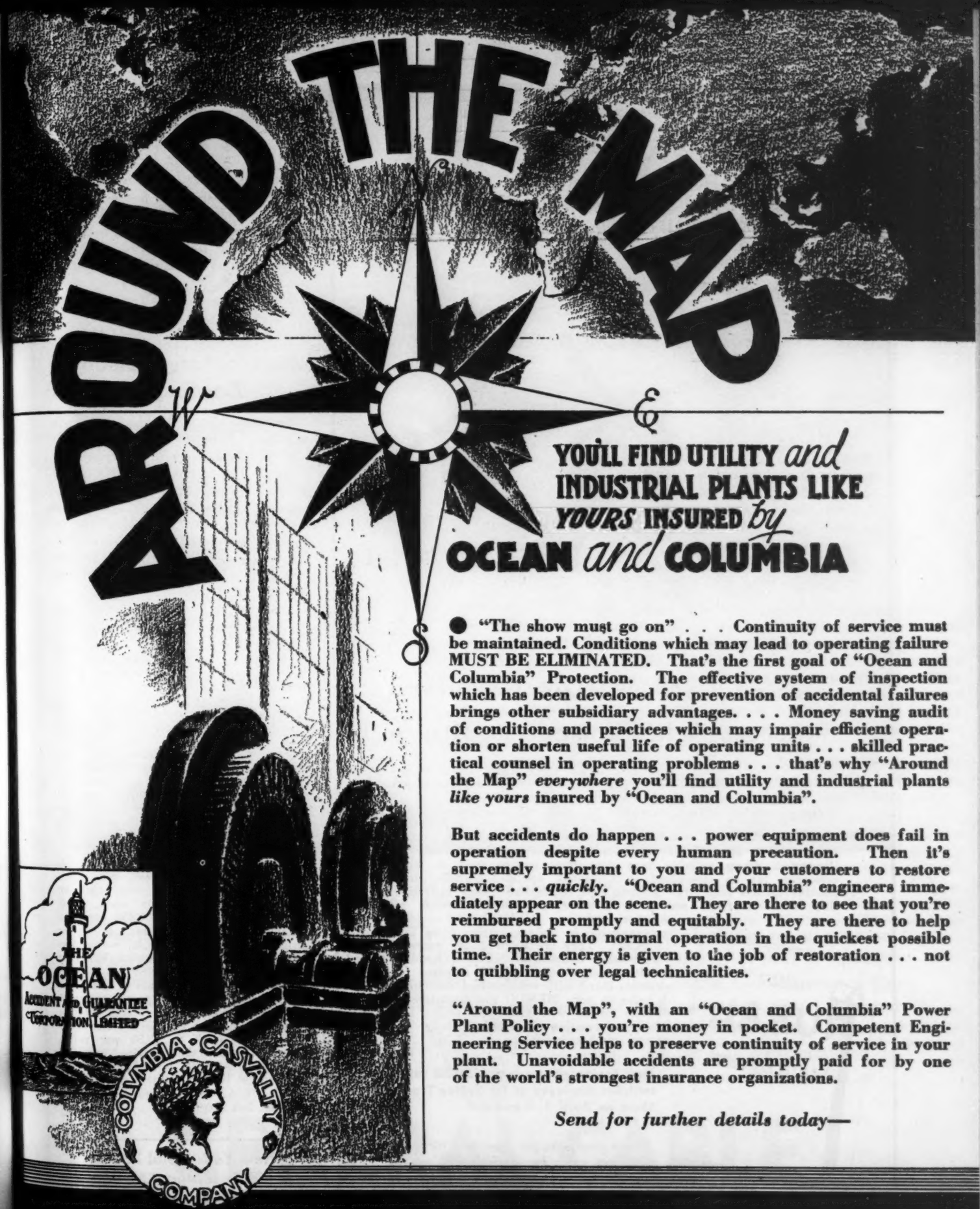
Orders received for transmission and distribution equipment in January held up closely to the December level, but orders for motors and generators dropped sharply, according to NEMA index numbers. Figures for both groups, however, were far above those reported a year ago.

For the first-named class the new index, 121.3, represents a decline of 1.9 per cent, but the gain over January, 1939, was almost 50 per cent. The

Month	Motors and Generators		Transmission and Distribution	
	1939	1938	1939	1938
February	67.8	70.8	108.3	79.3
March	99.3	74.7	129.1	91.4
April	77.5	66.6	103.0	105.4
May	76.8	62.5	117.2	77.3
June	87.8	76.0	102.0	84.7
July	76.0	59.1	121.2	73.0
August	94.3	60.2	108.8	90.8
September	116.4	62.7	154.4	87.0
October	136.5	61.0	159.8	76.3
November	125.1	67.6	137.3	73.1
December	161.7	72.1	123.6	79.4
	1940	1939	1940	1939
January	97.3	69.2	121.3	81.0



N.E.M.A. INDEX, value of orders for motors (large d.c., polyphase, synchronous) and generators (engine, belt-driven); for transmission and distribution equipment



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● **"The show must go on" . . . Continuity of service must be maintained. Conditions which may lead to operating failure MUST BE ELIMINATED. That's the first goal of "Ocean and Columbia" Protection. The effective system of inspection which has been developed for prevention of accidental failures brings other subsidiary advantages. . . . Money saving audit of conditions and practices which may impair efficient operation or shorten useful life of operating units . . . skilled practical counsel in operating problems . . . that's why "Around the Map" *everywhere* you'll find utility and industrial plants *like yours* insured by "Ocean and Columbia".**

But accidents do happen . . . power equipment does fail in operation despite every human precaution. Then it's supremely important to you and your customers to restore service . . . *quickly*. "Ocean and Columbia" engineers immediately appear on the scene. They are there to see that you're reimbursed promptly and equitably. They are there to help you get back into normal operation in the quickest possible time. Their energy is given to the job of restoration . . . not to quibbling over legal technicalities.

"Around the Map", with an "Ocean and Columbia" Power Plant Policy . . . you're money in pocket. Competent Engineering Service helps to preserve continuity of service in your plant. Unavoidable accidents are promptly paid for by one of the world's strongest insurance organizations.

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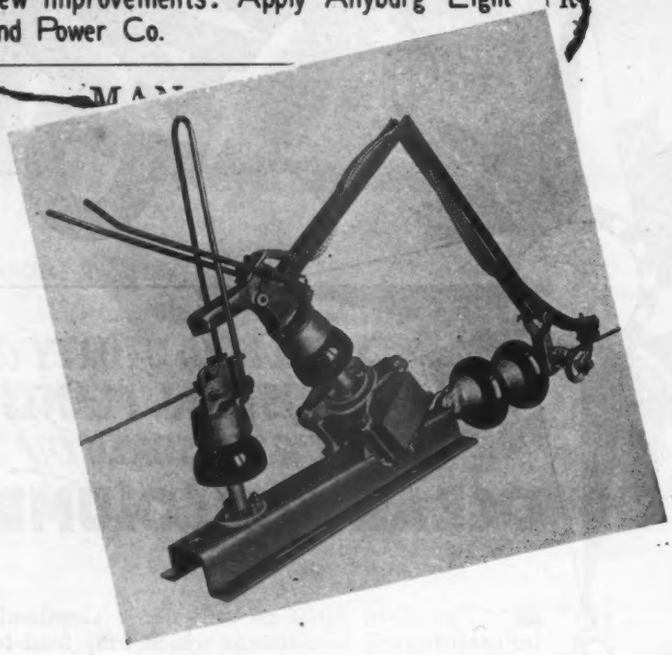
Low cost Rural Switchgear. Must have modern "high pressure contacts" and other new improvements. Apply Anyburg Light and Power Co.



You Get *Improved* Low Cost Rural Switchgear When You Specify Memco

Here's a line of rural switchgear which stays within the low cost limits of rural installations yet has many of the advantages of the heavier duty type.

These switches feature improvements such as "high pressure contacts" on both the group and the hook operated type. For ease of installation on crossarms they are assembled on pressed channel bases with a combination of holes and slots on the flanges. As illustrated, group switches may use either square steel or wood crossarms for an interphase shaft. Hook operated switches have positive latches and large pulling eyes to facilitate stick operation. Rugged construction guarantees positive performance under all weather conditions. MEMCO rural switches are available in voltage ratings from 7500 to 34,500. They are rated at 200 amperes for switches listed with N.E.M.A. standard insulators or at 200 or 400 amperes for switches listed with sub-standard insulators. A letter to your MEMCO representative or directly to us will give you prices and other information concerning these improved rural switches.

New Englanders may see MEMCO rural switches displayed at the Boston Trade Show on April 3, 4 and 5.

Before specifying for your next rural installation write for Bulletin 397 which has helpful dimensional and technical data on these low cost switches.

"Specify MEMCO Switchgear"

MEMCO ENGINEERING & MANUFACTURING CO., Inc. LONG ISLAND CITY, N. Y.

decline from December in motors and generators was 39.8 per cent but the new index, 97.3, is a third higher than it was a year ago.

Also, with one slight exception in each series, the latest indices are higher than the corresponding figures for any of the first eight months of 1939. They appear to mark a cessation of the spurt shown in the last third of that year but it remains to be seen whether or not they indicate the early stages of a definite downward trend in the curves.

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Manufacturers Issue Earnings Reports

Emerson Electric Manufacturing Co.'s sales and profits in January were the best for any January in the company's history. The first three months of the company's fiscal year (October, November and December) were better than the preceding year. These four months normally constitute a slack period for the company. However, sales for the four months ended January 31 were up 90 per cent.

Among the other manufacturing companies issuing reports are the following:

SQUARE D—For the year 1939, net profit of $1,038,491, equal to $3.02 each on 343,860 shares of $1-par common stock, compared with $403,799, or $1.17 a share, the year before. F. W. Magin, president, states that earnings on 421,360 shares of common stock, including stock issued to cover acquisition as of December 30, 1939, of Kollsman Instrument Co., Inc., and including 1939 earnings of Kollsman Instrument Co., Inc., with allowances for non-recurring charges, amount to approximately $3.20 per share. This figure represents earnings per share of common stock after deducting $100,000 for payment of dividends on preferred stock.

CURTIS LIGHTING, INC.—Including Canadian subsidiary, for 1939, net profit, $58,167, equivalent to 34 cents each on 170,160 shares of common stock. This net income is before a $60,850 provision for the loss on the liquidation of the Curtis Lighting Europe, S.A., which was charged direct to surplus. In 1938 the company had a consolidated net loss of $25,970, including the results of the European subsidiary. In the proxy statement for the annual meeting on March 26 it is proposed to change the 170,610 shares of no-par value stock to $2.50 par value. This will reduce the carrying value of the stock to $425,400 from $1,302,611.

AMERICAN TRANSFORMER—For 1939, net income $18,762, or 34 cents a share; for 1938, net loss $10,928.

New York Metal Prices

	March 19, '40 Cents per Pound	March 13, '40 Cents per Pound
Copper, electrolytic	11.50*	11.50*
Lead, A. S. & R. price	5.25	5.25
Antimony	14.00	14.00
Nickel, ingot	35.00	35.00
Zinc, Spot	6.14	6.14
Tin, Straits	46.50	48.75
Aluminum, 99 per cent	20.00	20.00

*Delivered Connecticut Valley.

"Through Every Step"

Limiting its activity solely to the making of electrical wires, cables and accessories, General Cable carries the processes of manufacture through every step in its own plants. General Cable rolls its own copper rods, draws its own wire, creates its own insulating compounds, and does all those many other things involved in the manufacture of electrical conductors. Through every step, quality is held to standards prescribed by the General Cable Research Department and maintained within the same exact limits in all company plants. Uniformity of quality has been an outstanding advantage of General Cable Wires and Cables.

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A New Principle for Connecting Tubular Buses

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Field Reports on Business

Plans of utilities to spend more than $600,000,000 on construction this year have undergone no appreciable change because of business. Orders are being placed as work progresses. Business leaders believe a base for an upturn is being formed. Spring buying is in evidence.

NEW YORK

Seasonal purchases are showing an expansion and there are no indications that business will slump sharply from present levels. Opinion is that the trend will be upward, due to normal industry demands and spur of domestic and foreign war orders. Inventories are being eaten into at a rate which indicates that production is at the rate of incoming orders. Business is now at about the same level as before the declaration of war. The feeling is that the correction is completed.

Reports that the utility industry was slashing construction budgets is unfounded. The major holding companies stated this week that no slashes have been made, nor are any being anticipated. The tendency is to lift the totals should business expand and financing made easier. Work is proceeding as scheduled.

Consolidated Edison of New York is spending about $250,000 in promotion on its General Electric vacuum cleaner campaign now under way. Floyd L. Carlisle, chairman, told stockholders this week that manufacturers will be several weeks in catching up with appliance orders now placed. Kelvinator has advanced the price of its $119.95 model to $124.95.

NEW ENGLAND

Some slowing down in industrial electrical equipment orders was noted during the past week; on the other hand, inquiries from utilities were very strong and a large volume of material will be bought soon. Again, some special lines are less active for the moment, while an increase in interest in motor-pumping units is current.

A substation order for switches and control apparatus amounting to approximately $15,000 was placed recently; more than $6,000 worth of small motors was purchased from one manufacturer during the past fortnight, and communication supplies amounting to $43,482 were bought by the government from a New England manufacturer. Reliable sources estimate more than $1,000,000 in utility requirements will be placed this spring. A large amount of wiring supplies and pole line materials are included in the $22,500,000 expansion program announced last week by the New England Telephone & Telegraph Co. About $10,000,000 of this sum will be spent in the Boston area alone.

Norton Co., Worcester, Mass., has purchased two 50,000-lb.-per-hour, 750-lb.-per-sq.in. boilers from the Riley Stoker Corp. and a 2,500-kw. bleeder type turbo-generator from the General Electric Co. Hygrade-Sylvania Lamp Corp. has leased 69,000 sq.ft. of manufacturing space in Ipswich, Mass., and will transfer its production of fluorescent lamps from Salem, Mass., about April 1. Further plant expansion in this area reported lately includes an addition of a new storage warehouse by the Simplex Wire & Cable Co., Cambridge, Mass., which will add about 12,500 sq.ft. of floor space.

Worcester, Mass., issued 309 wiring permits in February, against an average of 210 for that month over a five-year period. The seventh annual Electrical Trade Show will be held April 3-4-5 in the exposition hall of the Boston Garden, Boston, Mass.

PACIFIC COAST

February building permits in the seven Western states totaled 3 per cent less in value than in January, though about 20 per cent more than in February last year. Electrical business is good, and varied in both volume and location, with few "dead spots" throughout the Western states, excepting retail business in the recently flooded area in northern California. Favorable factors include rural service extensions by power companies in many sections and major expenditure programs such as the Pacific Gas & Electric Co.'s in central California; new steam generating stations averaging $4,000,000 each at Oleum and San Diego; marine electric equipment for about 25 cargo carriers scattered among coast shipyards; transmission and distribution line material for many sectors of the Bonneville and Grand Coulee systems, and heavy machinery for several others.

Recent low bids on various projects included $7,272 for 75- and 200-kva. transformers for Parker, Arizona, Indian irrigation; $142,803 for substations, lighting and distribution system at Hot Springs, New Mexico; $1,615,706 by a San Francisco builder for Mare Island drydock, of which 10 per cent is expected to cover elaborate electrical installation; $65,042 aluminum wire and $65,463 copper wire bids for the 32-mile, 115-kv. Yakima-Ellensberg sector of the Bonneville system; $250,800 for three 36,000-kva. GE transformers for Grand Coulee, and $21,049 for four 230-volt G.E. station lightning arresters for Colorado River aqueduct system of Los Angeles.

CHICAGO

There was more evidence in the general trend of business that a change for the better may be imminent. In a few lines such as steel, the rate of production was stepped-up over the previous week's level; output in the automobile industry continues to increase; and retail trade last week was 6 per cent above a year ago.

There is a comparatively high rate of activity in public utility construction throughout the Middle West. A majority of the utilities in this area are actively carrying on rather large scale programs involving expansion and rehabilitation of facilities. In addition, there is a sizeable volume of construction work in progress on industrial plants. Permits for residential building have been steadily increasing over the past few weeks.

Electrical manufacturers report a fairly good demand for motors and control apparatus. Wire and cable sales are well above the level a year ago. Sales of fluorescent lighting equipment are especially good. Dealers report refrigerator sales well in advance of a year ago. Bids have been asked on 42,400 lbs. of weatherproof line wire, 30,000 ft. rubber insulated copper wire, 32,000 cable hangers and four 50 kva. power distribution transformers.

AEG Shows 24% Gain in '39 Over '38; All-Time High

Despite the war, turnover of Allgemeine Elecktrizitaets-Gesellschaft (AEG) in 1939 was 602,000,000 Reichsmarks, as compared with 487,000,000 in 1938, a record level, and an increase of about 23.6 per cent, according to *Electrical and Radio World Trade News.* The report also stated that the export trade was maintained at the previous level during the year, in spite of growing difficulties.

The increase over the previous year compares very favorably with that shown for manufacturers of electrical machinery, apparatus and supplies in the U. S.—24.1 per cent, according to the Department of Commerce.

•

Federal Agencies Award Contracts for Supplies

Several supply contracts have recently been awarded to electrical manufacturing companies by Federal agencies:

Anaconda Wire & Cable Co., Navy, electric cable, $36,466.

General Electric Co., Navy, electric cable, $37,502.

Habirshaw Cable and Wire division, Phelps Dodge Copper Products Corp., Navy, electric cable, $31,980.

Phelps Dodge Copper Products Corp., War, cable, $15,324.

Circle Wire & Cable Corp., War, cable, $14,799.

Okonite Co., Navy, electric cable, $32,984.

Rockbestos Products Corp., Navy, electric cable, $74,722; a second contract from the Navy for electric cable, $12,343 and a third contract from the Navy for electric cable, $36,033.

•

Washer-Ironer Week Set

October 19–26 has been chosen as the dates for the third annual National Washer-Ironer Week, J. R. Bohnen, executive secretary-treasurer of the American Washer and Ironer Manufacturers' Association, has announced. Promotion of the week produced the industry's biggest retail volume in 1938 and again in 1939.

•

Send Stockholders Book

Westinghouse Electric & Manufacturing Co. is making its 50,000 stockholders company-minded by sending them a copy of its publication, *Engineering Progress.* It is hoped that stockholders will gain an idea of the achievements of the year by the company, what it manufactures and its progress in engineering.

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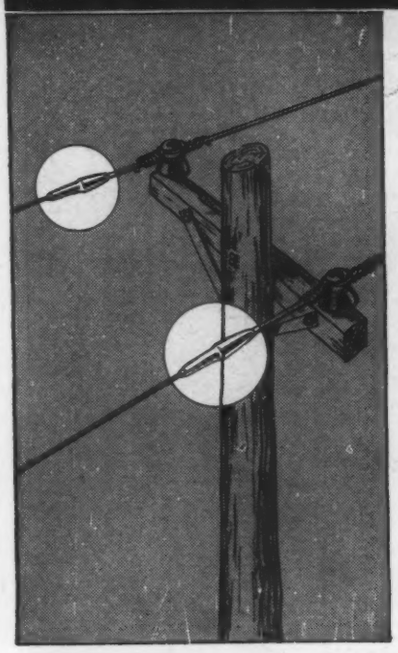

Urban construction where line drops portion of load and smaller wire size will carry current flowing through the rest of circuit.

RELIABLE
STRAIGHTLINE
REDUCERS . . . .

Save money and clean up appearance while eliminating a double dead-end. Sag of larger wire is only increased two or three inches as spans of city distribution are short.

Reliable
ELECTRIC COMPANY
OVER 25 YEARS SERVICE TO THE UTILITIES

Manufacturers Make Sales Assignments

Manufacturing companies have recently made the following announcements concerning sales staff operations:

Curtis C. Musgrove, Pacific Electric Manufacturing Co. representative, will henceforth operate in an enlarged territory, including the whole state of Texas (except El Paso) and Oklahoma and Louisiana. His offices are 508 Insurance Building, Dallas.

Charles M. Chapman is now representing Cochrane Corp. on flow meters in the Cincinnati territory covering parts of Ohio, Indiana and Kentucky. Mr. Chapman's office is in Room 715 of the Schmidt Building, Cincinnati.

•

General Electric Turbine Orders Total 1,000,000 Kw.

Turbo-generators ordered from General Electric for domestic utility and municipal power plants since January 1, 1939, in ratings of 10,000 kw. and higher exceeded the 1,000,000-kw. mark in the fourteen months ended February 29, according to C. S. Coggeshall, manager of the turbine division.

The total, Mr. Coggeshall said, is equal to the total orders placed with the company during 1937 and 1938 and is within approximately 200,000 kw. of the orders in 1929 in rating of 10,000 kw. and higher. He said that the orders indicate a definite trend to higher temperatures and pressures and use of hydrogen cooling in power-generating equipment.

•

Awarded Wire Contract

United States Indian Irrigation Service, Los Angeles, Calif., has awarded a contract to the General Cable Corp., New York, for copper conductor and wire for Colorado River Indian Irrigation project, vicinity of Parker, Ariz., as follows: 32,600 lb. No. 4 AWG, bare three-strand hard-drawn copper conductor at $17.05 per cwt.; 3,300 lb. No. 2 AWG, similar conductor at $16.80 per cwt., and 240 lb. No. 6 bare solid, soft-drawn annealed tie wire at $17.02 cwt.

•

Clark Controller Dividend

Directors of the Clark Controller Co. have declared a dividend of 25 cents per share on the common stock payable March 26 to holders of record March 20. This compares with 50 cents paid on December 22, last, and 25 cents paid on August 12, last. Last year at this time no dividends were declared. Business was reported about 21 per cent better than at the corresponding 1939 period. L. Russell Ranson, director of research, was elected a director.

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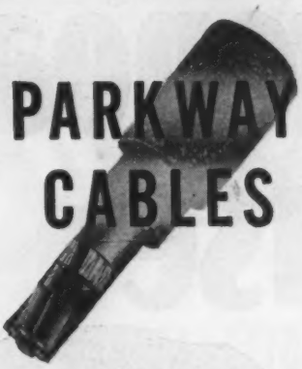

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Distortion-proof Fargo "6000" Connectors retain their streamlined "figger" and bulldog grip under highest service pressures. They're built for repeat use . . . handle as easily, grip as firmly after years of service as the day you take them out of the carton. Specify Fargo "6000" in your next connector order, you'll use them over and over again. No. 6 and No. 4 now available; additional sizes at a later date.

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Sales Opportunities

ST. PAUL, MINN.—Northern States Power Co., Minneapolis, Minn., has plans maturing for expansion in steam-electric generating station at St. Paul, with installation to include turbine-generator unit, high-pressure boiler and auxiliary equipment to provide about 67,000-hp. additional capacity. Work is scheduled to begin as soon as soil conditions at plant site and other details have been determined.

COLUMBIA CITY, ORE.—Columbia City Metals, Inc., care of Howard Davis, head of Stark-Davis Co., 933 S.W. Third Street, Portland, Ore., recently organized by Mr. Davis and associates, plans installation of motors and controls, switchgear, conveyors, electric hoists, loaders and other equipment in new iron ore reduction plant at Columbia City, near St. Helens, Ore., where site has been selected. It will consist of several units, equipped for initial capacity of about 1500 tons of pig iron per day, with all primary processing machinery electric-operated. Contract for power supply is being made with Administrator, Bonneville project, and transmission line will be built from connection with Bonneville power system to plant site, where power substation will be constructed. Company will develop iron ore properties for plant requirements near Yankton, about four miles from mill site. Estimates of cost of project are being made. Edwin D. Hicks, Pacific Building, Portland, is one of incorporators of new company.

PHILADELPHIA, PA.—Public Works Office, Building No. 1, Navy Yard, Philadelphia, receives bids until April 3 for substation, transformers, switchgear, power panels, duct lines and auxiliary equipment for naval aircraft factory at local yard (Specifications 9648).

MERIDIAN, MISS.—Mississippi Power Co. has contracted with Flintkote Co., 50 West Fiftieth Street, New York, for power supply for new insulating board and wallboard-manufacturing plant on site near city, recently referred to in these columns, and will build power line to mill site, where substation will be erected. Work estimated to cost over $100,000, including power substation apparatus. Erection of plant will begin soon under direction of Rust Engineering Co., Clark Building, Pittsburgh, Pa., and Martin Building, Birmingham, Ala., which has been awarded contract. Mill will have capacity of over 5,000,000 square feet of finished material per month; machinery will be electric-operated. Cost estimated over $2,000,000.

SAN DIEGO, CALIF.—Consolidated Gas & Electric Co. has negotiations under way with City Harbor Commission for long-term lease on tract of tidelands property at foot of Ninth Avenue, to be used as site for new steam-electric generating station. Plant will be designed for three units, each to cost close to $3,000,000. Plans for initial unit will be prepared soon, with installation to include turbine-generators and accessories, high-pressure boilers and auxiliary equipment, switch-yard structure, feeder lines, etc. This will be part of 1940 expansion program of company. Two other station units noted will be built at later date.

LARAMIE, WYO.—Bureau of Reclamation, Denver, Colo., receives bids until April 4 for new 7,000-kva. power substation near Laramie, Kendrick project, Wyo., to be connected with 115-kv. transmission line from Seminoe power plant to Cheyenne, Wyo., installation to include three 2500-kva. single-phase transformers, to step-down voltage from 115,000 to 13,800 volts; air-break disconnecting switches, voltage regulators, and auxiliary equipment (Specifications 899).

GENESEO, ILL.—City Council has plans nearing completion and will take bids soon for new municipal power plant. Warren & Van Praag, Decatur, Ill., are consulting engineers.

FREEPORT, TEX.—Dow Chemical Co., Midland, Mich., plans installation of motors and controls, transformers and accessories, switchgear, conveyors and other equipment in new plant at Freeport, where tract of about 800 acres of land is being acquired, with three-mile frontage on Brazos River. It will comprise several large one and multi-story buildings for production of chlorinated specialties, with storage and distributing structures, power house, pumping station and other operating units. Cost estimated close to $5,000,000. Proposed to begin work soon. Austin Company, 16112 Euclid Avenue, Cleveland, Ohio, is engineer.

HARRISBURG, PA.—Pennsylvania Turnpike Commission, 1 North Fourth Street, Harrisburg, will take bids soon for electrical system for section of new Harrisburg-Pittsburgh highway in Westmoreland and Cumberland Counties, for which final plans are nearing completion.

TONGUE POINT, ORE.—Bureau of Yards and Docks, Navy Department, Washington, D. C., is arranging for early call for bids for power plant equipment for new station at Tongue Point, including electrical distributing lines (Specifications 9484).

BROOKLYN, N. Y.—Signal Corps Procurement District, 58th Street and First Avenue, Brooklyn, receives bids until April 5 for 32,320 to 101,000 lineal feet of telephone cable, and 32 to 100 cable reels (Circular 328); also, at same time, for about 259,000 lineal feet of telephone cable, and cable reels (Circular 331).

READING, PA.—Metropolitan Edison Co. has plans nearing completion and is scheduling call for bids early in summer for proposed addition to local steam-electric generating station, previously noted in these columns, forming part of 1940 expansion program of company. Structure will be 80 x 225 feet, and 90 feet high, with installation to include a new 20,000-kw. turbine-generator unit and accessories, high-pressure boiler and auxiliary equipment. E. M. Gilbert Engineering Corp., 412 Washington Street, Reading, is consulting engineer.

ST. LOUIS, MO.—Board of Public Service, City Hall, receives bids until April 2 for boiler, superheater and auxiliary equipment (Contract 5022) and for stoker and accessories (Contract 5023), all for installation in power plant at City Hospital No. 1.

WATERLOO, IOWA—Rath Packing Co., Sycamore and Elm Streets, meat packer, has authorized plans for expansion and improvements in power station at local packing plant, including new one-story and basement extension and installation of equipment for considerable increase in present capacity. Proposed to carry out work late in spring. Bids will be asked soon. Helmick, Edeskuty & Lutz, Essex Building, Minneapolis, Minn., are consulting engineers.

PORTLAND, ORE.—Administrator, Bonneville Project, Department of Interior, 811 N. E. Oregon Street, Portland, receives bids until April 4 for quantity of 69-kv. oil circuit breakers (Circular 849).

Recent Rate Changes

DUQUESNE LIGHT CO. has voluntarily adopted a $1,724,000 yearly reduction in rates, the Pennsylvania Public Service Commission has announced. The new rates go into effect after the company submits a new schedule for the commission's approval. Commissioner Richard J. Beamish, in announcing the agreement, said the new schedule will be approved immediately. The new schedule would provide for a reduction of $992,000 a year in the bills of 310,044 household consumers in its area, and would also provide a reduction of $450,000 a year to 31,835 small light and power consumers in the commercial rating; $132,000 a year for 2,654 large power users and $115,000 to municipalities.

PORTLAND GENERAL ELECTRIC CO. and the Northwestern Electric Co. have been ordered by the Oregon Utilities Commission to make further reductions in residential electric rates. The annual savings will aggregate $120,000, in addition to a $700,000 annual saving involved in a previous rate reduction order which became effective January 1. Revised commercial rates were also ordered by the board.

SOUTHWESTERN GAS & ELECTRIC CO. has announced an average reduction of 7.7 per cent in electric rates for more than 60 western Arkansas cities and towns. Residential rates were cut 8.1 per cent; commercial schedules 6.1 per cent. The commission estimated annual saving of $55,239 to customers.

ARKANSAS-MISSOURI POWER CORP. has agreed to reduce electric rates in northeast Arkansas an estimated $40,000 a year. Based on 1939 business, the commission estimated there would be the following savings on various types of service: commercial, $26,176; residential, $6,844; combination light and power, $2,328; municipal street lighting, $2,943; municipal sewage pumping, $84.

BRADFORD ELECTRIC CO. has submitted a new and simplified tariff to the Pennsylvania Public Utility Commission which will save present customers approximately $14,150 a year. The new rates are to be effective for all billings resulting from meter readings after March 31. Six schedules will be eliminated. It is estimated that $8,450 of the reduction will be applicable to residential customers. The new commercial or general rate which will also be effective over the company's entire territory, effects estimated reductions of $5,700 to approximately 107 customers.

ILLINOIS COMMERCE COMMISSION announced that rate changes effective in the State of Illinois during the month of February resulted in an estimated reduction of $23,386 in annual operating revenues. Total electric rate reductions totaled $22,494.

DAYTON POWER & LIGHT CO. has been authorized by the Ohio Public Utilities Commission to revise its residential schedule for the Dayton city district as follows: First 15 kw.-hr. or less per month, 75 cents (unchanged); next 25 kw.-hr. 5 to 4.5 cents per kilowatt-hour; next 50 kw.-hr. 4 to 3.5 cents per kilowatt-hour; from all over 90 kw.-hr. at 2.5 cents to 2.5 cents per kilowatt-hour for the next 110 kw.-hr. and in excess of 200 kw.-hr., 2 cents per kilowatt-hour.

TAMPA ELECTRIC CO. has been ordered by the Tampa Utility Board to cut its lighting rates within this city by an average of 35 per cent. The order does not affect service in the suburbs and does not

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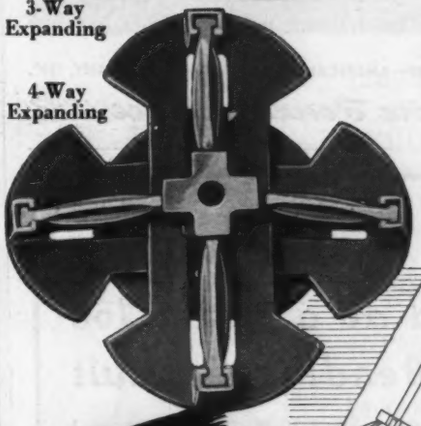

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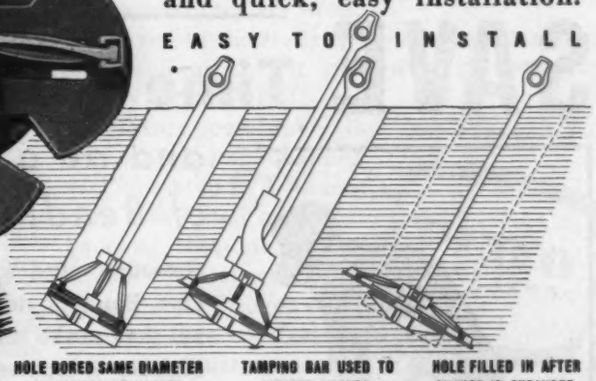

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GREENLEE TOOL CO., 1705 Columbia Ave., ROCKFORD, ILL.

apply to the company's other properties in Plant City, Dade City and Polk County. The utility board was created for the city by an act of the 1939 Legislature.

KEWAUNEE, WIS., common council has authorized a reduction in electric rates for customers of the municipal electric plant amounting to more than $2,400 annually.

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Municipal Plants

SPENCER, MASS.—A proposal to establish a municipal electric plant in this town was killed on March 7 by a vote of 194 to 74. At the town meeting where the issue was discussed it was brought out that if the plan were carried out and the electrical business of the Spencer Gas Co. acquired, it would be necessary to purchase the gas plant as well. The project threatened a substantial increase in the town's tax rate, and this did not appeal to the voters.

PARAGOULD, ARK.—Circuit Judge G. E. Keck has sustained the defense demurrer in the suit of the city against the Arkansas Utilities Co., seeking $284,876 for alleged damages caused by delay in building the municipal light and power plant. The city will take an appeal to the state supreme court.

NEW LONDON, MO.—Proposal to issue $29,500 of bonds for establishment of a municipal electrical distribution system was defeated by voters of that community at a recent special election. The vote was 257 for and 196 against, but a two-thirds vote, or 302 votes, was necessary for passage. The proposed municipal distribution system would have obtained its power from the Hannibal, Mo., power plant and would have replaced service now being supplied by the Missouri Power & Light Co.

OREGON, WIS.—Village board has voted to acquire the property of the Oregon Electric Co. for $65,000 and to operate the property as a municipal utility. The board's action, however, is subject to a referendum on the purchase at the April election. Oregon voters in 1936 decided in favor of the acquisition by a 31 majority.

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Appliance Tax Exemption

The Attorney-General's office has advised District Attorney J. H. Bennett of Vernon County that a 1939 Wisconsin statute which substituted a 3 per cent gross receipts levy on electrical co-operative associations in lieu of other forms of taxation exempts such co-operatives from paying personal property taxes upon stocks of electrical appliances kept for sale to the public.

•

Honor 39 Employees

Westinghouse Electric & Manufacturing Co. conferred the Westinghouse Order of Merit on 39 employees during 1939. More men received this medal and citation in 1939 than in any single year since inception of the order in 1935. It has been conferred on 124 employees since that date for outstanding ability.

New REA Allotments: Contracts Awarded

Allotments totaling $779,000 for rural electrification systems in twelve states have been announced by Harry Slattery, Administrator of Rural Electrification. These allotments provide for the establishment of three new systems and the enlargement of seven others.

One of these allotments is for a so-called "self-help" project, the White River Valley Electric Co-operative of Hollister, Mo. Another will be used to construct a generating plant in Otero County, N. M.

Details of the allotments follow:

GEORGIA—Tri-County Electric Membership Corp., Gray, W. T. Roberts, president, $161,000 to build 216 miles of line, 622 members in Jones, Baldwin and Putnam counties. Slashpine Electric Membership Corp., Homerville, $152,000 to build 168 miles of line, 549 members in Clinch, Lanier, Atkinson, Berrien and Ware counties.

INDIANA—Jay County REMC, Portland, Richard M. Hurst, supt., $20,000 to build approximately 28 miles of line in Adams and Randolph counties.

MISSISSIPPI—Monroe County Electric Power Assn., Amory, A. H. Ritter, manager, $17,000 to build 20 miles of line, 119 members in Monroe, Lowndes and Itawamba counties.

MISSOURI—White River Valley Electric Co-operative, Inc., Hollister, Frank A. Dawes, president, $148,000 to build 150 miles of line, 540 members in Taney, Christian and Stone counties.

NEW JERSEY—Tri-County Rural Electric Co., Inc., Freehold, William Jackman, supt., $25,500 to build 23 miles of line, 136 members in Ocean county.

NEW MEXICO—Otero County Electric Co-operative, Cloudcroft, R. W. Morrison, supt., $60,000 for the construction of a generating plant.

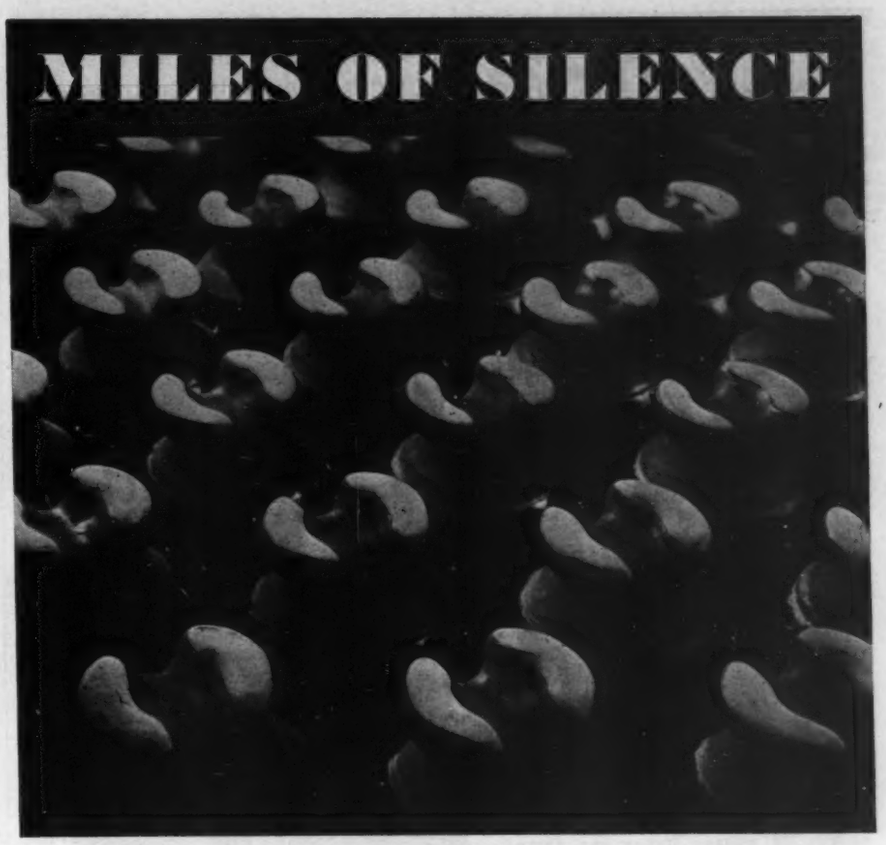
NORTH CAROLINA—Union Electric Membership Corp., Monroe, H. W. Cunningham, supt., $12,000 to build 15 miles of line, 63 members in Mecklenburg, Union, Stanly, Cabarrus and Rowan counties.

OKLAHOMA—Caddo Electric Co-operative, Binger, John W. Bryan, supt., $25,000 to be lent to the Fort Cobb Electric Refrigeration Co-operative, Fort Cobb, for construction of a refrigerated food storage and processing plant to serve some 300 members in the project area.

SOUTH CAROLINA—Marion Electric Co-operative, Inc., Marion, L. T. Leitner, supt., $20,000 to build 22 miles of line, 104 members in Marion and Dillon counties.

TENNESSEE—Middle Tennessee Electric Membership Corp., Murfreesboro, W. W. McMaster, supt., $20,000 to complete the project and to defray certain expenses connected with the initial operations of the project which cannot be covered by the construction loan. Gibson County Electric Membership Corp., Trenton, Floyd Jones, supt., $75,500 to build 51 miles of line, 166 members in Crockett and Lake counties.

VIRGINIA—Central Virginia Electric Co-operative, Lovingston, Lewis A. Bress, supt., $15,000 to complete project and to defray certain expenses connected with the initial operations of the project which



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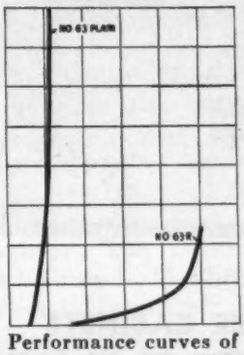

Performance curves of Pinco Plain and "NOCORONA" Nos. 63, 63R 13.5 KV One-Piece Insulators.

Long lines of stretching wires that sing only in the wind are those mounted on Pinco "NOCORONA" Quiet Insulators At radio frequencies they are *silent.*

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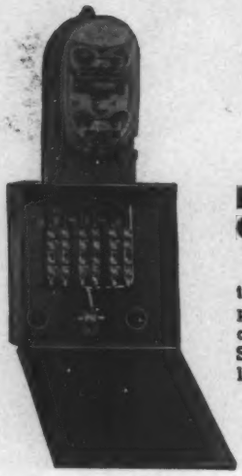

Catalog No. M-1-6

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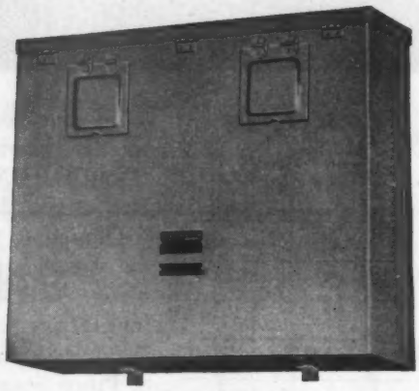
Equipped with Standard NELA Removable Meter Trims to fit any standard bottom connected meter up to 75 amperes. Adapted to addition "horse collar" trims for side connected meters. Black steel, finished in black enamel. Special orders filled. All cabinets equipped with insulated neutral block.



Catalog No. W-213

W-13 with Conduit Hubs

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For housing one Watthour and one demand meter installed side by side. Wall or pole mounting Space provided for test blocks, when ordered. Built of aluminum or rust-resisting steel. Cover equipped with hinges and lip supports.

OUTDOOR METER BOXES

Highest quality cabinets of this type on market. Compact, convenient, roomy, handsome and low priced. Made of aluminum or rust-resisting steel. Dial easy to read. Hubs furnished at slight extra cost.

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WECO ATLANTA

Weco also produces a full line of *Socket Meter Troughs* and cabinets. Write for Catalog No. 8 for these listings

WALKER ELECTRICAL COMPANY
ATLANTA, GEORGIA

cannot be covered by the construction loan.

WISCONSIN—Jump River Electric Co-operative, Inc., Jump River, Gerald A. Thalacker, manager, $28,000 to build 39 miles of line, 132 members in Rusk, Taylor and Chippewa counties.

Among the construction contracts recently awarded are the following:

SOUTH CAROLINA—Laurens Electric Co-operative, Inc., Laurens, Henry M. Faris, supt., and B. O. Vannert, Charlotte, N. C., engineer, contract to Miller-Baxter Co., Inc., Indianapolis, Ind., another section of project, 76 miles of line, 289 members; bid $43,978.

TENNESSEE—Middle Tennessee Electric Membership Corp., Murfreesboro, W. W. McMaster, manager, and P. M. Sullivan, Gallatin, Tenn., engineer, contract to N. E. Yearwood, Nashville, Tenn., another section of power system, 203 miles of line, 627 members; bid $135,699.

TEXAS—South Plains Electric Co-operative, Inc., Lubbock, Charles C. Fagg, supt., and Midwestern Engineering & Construction Co., Tulsa, Okla., engineer, contract to Reinhart & Donovan Co., Oklahoma City, Okla., another section of system, 217 miles of line, 463 members; bid $99,650.

VIRGINIA—Community Electric Co-operative, Suffolk, J. E. Woodward, supt., and B. O. Vannort, Charlotte, N. C., engineer, contract to Melvin F. Burgess, Boone, N. C., for building entire power system, 239 miles of line, 796 members; bid $149,619.

WISCONSIN—Waupaca Electric Co-operative, Iola, Louis R. Rasmussen, supt., and Wisconsin Development Authority, Madison, Wis., engineer, contract to E. W. Wylie, Inc., St. Paul, Minn., another section of power system, 157 miles of line, 406 members; bid $104,000.

•

Holds Sales Conferences

York Ice Machinery Corp. has concluded the third in a series of nation-wide two-day sales conferences. John R. Hertzler, sales manager, announced a new complete line of air conditioning, refrigerating and heating equipment line. A number of new lines of "packaged" units and the York-Allis Chalmers turbo-compressor have been added. Sales of the new compressor from December 18 to January 1, 1940, totaled $500,000, which was three and one-fourth times the rate of sales of this type of equipment for the industry over the previous twenty months.

•

Aurora With 15,000 V. Seen

Scientists at the American Museum of Natural History, New York, have succeeded in creating an artificial display of the colorful aurora borealis by shooting a 15,000-volt current through a 4-ft. glass tube. As much air as possible is extracted from the test tube in an effort to duplicate the conditions existing in the rarefied upper atmosphere in the polar region.

Vault Shell Materials and Layout Proportions

[*Continued from page 38*]

advantage in favor of a multiple-bank vault without a separate compartment for housing the network protectors and/or secondary bus as compared to a single-bank vault if the two vaults are designed to use their space efficiently. In the case of the actual vaults analyzed, however, it was found that the average size of the single-bank vaults is 2.28 cu. ft. per kva., whereas the average size of the multiple-unit vaults is 2.49 cu. ft. per kva. Instead of being smaller, as was anticipated, the multiple-bank vaults were found to be 9 per cent larger than the single-bank vaults.

General Layout of Equipment

One very popular vault and equipment layout is shown in Fig. 1-a. A vault of these general dimensions will take a 500-kva. network unit and can usually be located even under a narrow sidewalk. Where more width is available and the length of this vault is objectionable a very satisfactory vault for a 500-kva. unit can be designed along the lines of the arrangement shown in Fig. 1-b. Multiple-unit vaults are often arranged similar to the double-unit vault for two 500-kva. units shown in Fig. 2-a. Double-unit vaults frequently consist essentially of two-single-unit vaults placed side by side or end to end without a wall between them, as shown in Fig. 2-a, 2-b and 2-c. Multiple-unit vaults of this type should prove entirely satisfactory when non-inflammable-liquid-filled transformers are used. If oil-filled transformers are used, however, it is desirable to use separate compartments for each network unit and for the secondary bus to prevent a vault fire resulting from the failure of one unit involving all units, all primary feeders, the secondary bus and the network ties and customers' service connections. Modifications of the double-unit vaults of Fig. 2 to provide separate compartments for each unit and the secondary bus are shown in Fig. 3. In these vaults one primary circuit should be brought into each transformer compartment and all secondary circuits should enter the vault through the secondary compartment walls. It is interesting to note that the size of all of the vaults shown in Figs. 1, 2 and 3 is less per cu. ft. per kva. than the average size of the vaults studied. Vaults somewhat larger than those shown would be desirable if the network protectors are mounted separate from their associated transformers.

There are, of course, many possible vault designs other than those shown in Figs. 1, 2 and 3, and available space or other conditions may make the use of one of them more desirable than any of those shown. In order to assist in the general layout of a vault to fit into some particular dimensions or to meet some particular conditions the accompanying table is included giving approximate overall dimensions of network units with various arrangements of the primary three-position switch and the network protector on the transformer. These dimensions are based on the use of normal loss submersible transformers and may be slightly different for high loss or vault type transformers.

Obviously before the final design of the vault is made the actual dimensions of the equipment to be installed should be obtained. The dimensions given for the 750- and 1,000-kva. units are for transformers with open type protectors mounted on them, as subway protectors are not available in 2,500- and 3,000-amp. ratings. The dimensions of these two units are of interest only in connection with the layout of building or other vaults where open type protectors can be used safely. The dimensions for a transformer with the three-position switch either on its side or end, but without the protector, cover transformers designed to take a network protector, but with the protector removed as may be necessary at times in order to get the equipment through the available equipment opening in the vault.

•

Output Hits New High

Electricity output for consumption in the Montreal area in February, according to a statement issued by the Montreal Light, Heat & Power Consolidated, was the highest ever recorded for that month in the history of the company, amounting to 108,983,740 kw.-hr., a gain of 12.74 per cent over February, 1939. This result was favorably affected by the extra Leap Year day, but even without this additional day output for the month was still a record one.

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★ Much less costly than spot checking

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★ Saves you investment and maintenance money

★ Helps you keep the system clear of defective equipment

★ Makes it possible to use less transformer sizes to meet all loads

★ Helps you to render a better service at less cost

Investigate each of these benefits—find out how you can accomplish all of them—let us give you interesting facts and figures on actual results of routine transformer checking. Learn among other things how the MAX-I-METER lends itself very readily to testing in areas where the transformer sizes vary considerably. Write for bulletin.

•

MAX-I-METER

The MAX-I-METER is a modern, lightweight, weatherproof, maximum-demand ammeter combined with a multi-range split core current transformer—4 ratios—which clamps over the conductor. No connections to make. No trailing leads. Ready for instant use—no support necessary. Accurate to 3% plus or minus. Not affected by ambient temperature. Can be easily reset and used immediately.

HD ELECTRIC CO.

100 W. MONROE ST. CHICAGO

1
Hang it on the wire . . .
2
Drop it, threaded U portion drops down and engages nut.
3
Insert tap wire and thread the connector tight...you get a perfect permanent contact.

L-M DROP-ON CONNECTORS

Save Time And Work On Every Tap-Off, Stand Up Under Highest Service Torques

How easily and speedily you tap a line with the L-M Drop-On Connector is shown in these photos. Note that the nut and body of the L-M Drop-On are always perfectly aligned, ready for threading the instant they come together. Note, too, there are no parts to lose . . . and no loose parts to cause radio interference. • You can use the L-M Drop-On Connector over and over again, year after year. It's built for repeat use. Its rugged body of high strength copper alloy *won't bend under highest service torques* . . . yet the L-M Drop-On design assures a perfect conductor contact at comparatively low torque. Specify the L-M Drop-On in your next connector order . . . you get its extra features at no extra cost.

LINE MATERIAL CO.

Human Relations Smooth Public Relations

[*Continued from page 45*]

nel was small and widely scattered), the problem of personal approach becomes increasingly difficult. But personal executive contact is far more effective than mere letters and notices, and should be always freely available. The man who knows his boss and knows his boss knows him is the most loyal and most useful worker.

No matter how perfect the service, the job is not completed or properly done until the customer is satisfied. Apply the golden rule. Treat your customers the way they like to be treated as individuals. Modify rules and policies which "make customers mad." Realize and acknowledge that the average American has some intelligence, is a decent and self-respecting person who, if accorded fair treatment and explanations, will give his friendship in return. A customer complaint, although unjustified, is real and must be remedied.

Get Acquainted With Customers

In his daily life the average citizen thinks of the utility company as something about on a par with his landlord, his family and his government. It is one of the things to which he is tied and is therefore an occasional source of irritation. Long periods go by during which he accepts the services provided by his utility company without consciousness of their source. As to rates, the average customer takes them about as they come. He grumbles from time to time, occasionally kicks to the company, but his grousing generally concerns fancied, not actual, overcharges.

Customer co-operation, and not the cut-off pliers, results in greater collection percentages and increases friendliness of customers who for one reason or another allow the discount date to slip past. Distinguish between the chronic and the genuinely hard pressed; the average customer is willing to make an effort to clean up bills if he is shown consideration. Merchandise bills separate from energy consumption bills are a decided advantage. Keep in mind the customer's past history; if excellent, go easy on shut-off. Be human, personally interested, kind. Get back to the level of contact with all customers on which the ancient faggot vender plied his trade.

Power Transformers Dried in Field by Vacuum

[*Continued from page 47*]

clean, dry transil oil, under full vacuum, completely immersing the transformer winding and core. It is allowed to stand for at least twelve hours and is then transferred to its own tank and completely reassembled. Its own tank is filled with oil as quickly as possible so that the windings will be exposed to the air for a minimum length of time.

Before the transformer is replaced in service the low-tension winding is short circuited and approximately 11,000 volts applied to the high-tension winding. This creates enough heat to circulate the oil and bring to the surface any air bubbles that may have been entrained. This is accomplished with about 5 in. of vacuum in the top of the tank and is carried on for at least twelve hours, with the top oil held at approximately 60 deg. C. The transformer is then returned to service.

So far seven 18,500-kva. transformers have been dried by the process. From four to nineteen gallons of water have been extracted from each transformer. Since being returned to service none of them has shown any signs of moisture.

At first the equipment was watched constantly, but this was found unnecessary. Present procedure is to have a test man on watch until the transformer is warmed up and the vacuum is up to full value. From then on the station operator checks once an hour to see that everything is normal, and once in 48 hours the test man records the temperature of all stations, the resistance of the high-voltage winding, the megger readings, and measures the water accumulated since the last set of readings. This change in procedure has greatly reduced time chargeable to the drying process. One of the last three transformers dried was in the vacuum tank 28 days. The total labor required for disconnecting the transformer from service, placing it in the tank, doing the drying and replacing it in service was only 416 man-hours, as compared with about 1,000 hours had it been necessary to have an attendant present 24 hours a day.

Our experience has shown that the spark plugs are satisfactory bushings for bringing out the leads to the temperature-indicating coils, but that bushings with more leakage distance across the porcelain are needed for megger connections. We also believe that so long as the temperature of the transformer windings and core can be maintained the continuous vacuum gives quicker results in removing moisture than the so-called cycling process, where the vacuum is maintained for a few hours and then dry air is admitted to the tank, this cycle being repeated throughout the drying process.

Samples of insulating material taken from the transformer barriers before the drying process showed as much as 2½ per cent moisture by weight. Similar samples hung in the tank with the transformer showed about one-tenth of 1 per cent after dryout.

Vigorous Promotion Builds Commercial Cooking Load

[*Continued from page 44*]

mercial show, replacement of old equipment with new, the methods of combating competition, whether it be tank gas, gas from mains, coal or oil, are all ways of carrying on this work.

These activities, co-ordinated with the assistance supplied by the manufacturers in the form of campaigns, direct mail and personnel representation, plus the help received from the Commercial Electric Cooking Council, particularly its distribution of the "Build Profits" bulletin featuring electric counter equipment, enables us to build up a cooking load which becomes more attractive to our management each year.

Our aim is to interest finally every potential customer to the point where he will allow us to make an installation of at least one piece of commercial electric equipment. This accomplished, we have driven a wedge which will make our job easier from that point on. We are following this thought by using the slogan, "An electric fry kettle in every food service establishment is our goal.".

We believe that we have only scratched the surface of a load-building activity that will continue to grow each year. The rate of growth will depend on how effectively we tell our story and how often. The electric way is certainly the finest way, and it is our duty to be continually telling the buying public *why*.

MATTHEWS SERIESWITCH

It Is a Fallacy to Take Chances

that some little boy or girl will not pick up or attempt to play with a live wire on the ground caused by an open circuit on a series circuit street lighting loop. Just because such an accident has not yet happened on any of your circuits, there can be no guarantee that it may not happen tonight, if your circuits are not adequately protected.

The reason for the development of Matthews Serieswitch is because a child was killed and a man injured within a few weeks of each other and some of those who had series street lighting circuits wanted an efficient and inexpensive device which would instantly cut out an open circuit, without affecting any of the rest of the main circuit or other loops off the main circuit.

It will pay you to look into the possibilities of Matthews Serieswitch, if you are operating series circuits, whether or not you have had any series lighting open circuit accidents. Send for Bulletin 532-B which gives complete information.

W. N. MATTHEWS CORPORATION
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Get the "CHAIR"
BEFORE APPROVAL

• All Miller Electrician's Gloves are inspected minutely for physical imperfections. But here's the final test. Sample gloves from every run are lowered into this water tank and subjected to a charge of 16,000 volts. If they can take it, they are ready for the lineman. If they can't, they're not considered worthy of the Miller name.

Miller Gloves have high resistance to current leakage and will withstand repeated electric tests over long periods because they are made by the Anode process. By the same token, they have greater tensile strength to resist tearing and snagging, possess long aging qualities, and are more uniform in thickness.

Miller Electrician's Gloves are available with straight or curved fingers in Class "A" and Class "B" weights. Write for literature and prices now. Their cost is no more than gloves of equal specifications.

MILLER RUBBER COMPANY, INC. • AKRON, OHIO

Hot Rolled Copper Rods • Bare and Tinned Strand
Bare and Tinned Copper Wire
(In Rounds, Flats and Squares)
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SALES OFFICES:
New York Chicago Cleveland Pittsburgh Detroit
Boston Richmond Philadelphia Los Angeles

X-Ray Pole Inspection a New Engineering Tool

[*Continued from page 35*]

current, was mounted on a sliding shelf in a spring-supported cabinet near the tailboard. Controls, including a one-minute timer and a special relay to protect the tube filament from overvoltage, were placed at the top of the cabinet and a resistance heating element at the bottom. A 2-kw. Homelite two-cylinder air-cooled gasoline engine and single-phase, self-excited generator met the problem of power supply, with 110 volts, 50 cycles. This unit was mounted on coil springs, behind the truck cab. Its exhaust pipes were run to a special muffler under the body. Finally, a cabinet for accessories was installed alongside the X-ray cabinet. In it are the "calipers" and a supply of 7 x 17-in. AGFA non-screen film in paper wrappers; also other incidentals such as film identification numbers. Shovels, crowbar, gasoline-oil fuel mixture for the two-cylinder engine and a rubber girth complete the equipment.

Operating in the field, the crew drives the truck just past the pole to be X-rayed and starts the Homelite. One man digs to expose the badly rotted section of pole, while the other prepares equipment and places the proper lead identification numbers in the holder, straps the girth around the pole and reads the exposure time from the printed scale on the rubber. Both then move the X-ray generator and calipers, weighing about 65 lb., to the pole, placing them so that the center of the X-ray beam is in the plane of the pole's neutral axis (as determined by transverse or longitudinal wire load) and intersects the weak pole section. Next, the film with its identifying numbers attached is put in its holder at the end of the caliper legs.

With the equipment thus placed, the men step out of the X-ray danger zone, set the timer and push the X-ray control button. When the film is properly exposed (five to 60 seconds, as shown in the curve), the timer deenergizes the X-ray machine. The operators stop the generator, return the equipment to the truck, backfill the hole and travel to the next pole. Several modifications are planned for the next mobile set, to improve quietness, safety, speed and accuracy of the operation.

At the end of the day films are returned to the central darkroom. Processing is done with X-ray chemicals in common photographic trays, so the processor can compensate to some extent for improper exposure by visual inspection of the film as it develops. Satisfactory results are obtained in this way, and it seems to take no longer to do the work in this "primitive" manner than with the recommended method involving fairly expensive and specialized processing equipment. (The recommended technique includes clipping the film in metal holders, setting them in deep tanks and regulating by time-temperature rules. Such procedure is ideal when expert technicians take radiographs under standard conditions, so that it can be assumed that optimum film exposure has been attained. In wood-pole work, however, there are too many unknowns for this ideal to be met; variables include not only species of tree and pole circumference but also moisture—internal and surface—degree of rot, pole treatment and ambient temperature.)

After the film is processed and dried it is ready for interpretation. The diagnostic elements have already been mentioned. The illustrations show clear-cut cases of good and poor wood, taken from our library of some 30 stages and degrees of rot. There is not sufficient space here to give details of intermediate cases. These, and further details of technique, will be covered later in papers before specialized societies. There is no perfect substitute for first-hand experience in this field—X-raying a pole, interpreting the film and then going back to the actual *sectioned* pole for comparison.

The diagnostician marks in pencil the limits of good and poor wood. From these marks he can calculate strength in any convenient way. We have made a scale, shown in the picture of the engineer analyzing the film, which tells what the strength will be three years after the picture was taken. This scale automatically cares for the reduction ratio between film measurements and true pole size, and also allows for ⅜-in. progress of rot which, for lack of better information, we assume will occur during the three years before the next routine inspection. We also assume that good and rotten wood occur in circular sections, the diameters of which are shown by the pencil marks. Stereoscopic views have been suggested for checking this, but it is likely that the error due to other shapes is too slight to warrant the extra cost of X-raying and the labor of computation.

The value of strength obtained from this analysis is compared with the load on the pole, which is calculated by simple charts used by the overhead lines department for several years. Poles with insufficient safety factor are condemned.

Tests Verify X-Ray Accuracy

Since this whole procedure would be worthless if we could not depend on its accuracy, a series of breaking tests was made on ten Northern cedar poles. These were inspected just below the ground by boring and by X-ray. Horizontal pulls from a truck winch were applied 25 ft. above ground and increased until the poles broke. Eight of the ten broke near the inspected section, three of them cracking at the boring-test plug. The condemnations made by X-ray were verified. The strength expected from X-rays averaged 16 per cent more than actual; individual differences ranged from 0 to 62 per cent. Similar tests on new poles would be likely to show an average difference of 10 per cent between calculated and test strengths and a 50 per cent individual variation would not be unexpected. This indicates that the strength of rotted poles can be found by X-ray inspection almost as reliably as new pole strength can be calculated.

Future Investigation

There are still some questions to be answered concerning the X-ray methods. For instance, we do *not* know whether or not we may save labor by taking pictures above ground. We *do* know that shell rot or incipient surface rot above the ground often reduces the strength at that section to practically the same value as the worst-looking portion below ground. We also know that in the breaking tests described as many poles broke above ground as below. Further investigation is needed before deciding whether or not the condemnations would be substantially the same by both tests. Taking radiographs without digging would not only save labor ordinarily, but would make feasible the X-raying of concreted poles and inspection when the ground

Matthews Stazrite Guards

shown above and below have no hardware on them. They are attached to the guy wire at the top and to one of the bolts of a three-bolt clamp at the bottom. They become a part of the guy fixture and can not vibrate loose, turn over or be made a greater hazard by "one-arm drivers." The upper photograph shows the 14-gauge half round and the lower photograph shows the 16-gauge full round types. Send for Bulletin C-2. Try them at our risk of your approval.

W. N. MATTHEWS CORPORATION

ST. LOUIS, U. S. A.

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is frozen. In preparation for the latter possibility tests have been made which show that frozen water-logged poles may be satisfactorily diagnosed by X-ray.

Space prohibits detailed acknowledgment of the help received from many individuals and corporations in this project. Those who have contributed are assured of the author's appreciation.

Rebuilt Turbo Unit Trims Production Cost

[*Continued from page 41*]

securely in place. There are a total of 48 such keys, 24 set in each end of the frame, each key long enough to pass through three of the inner frame rings.

The description of this procedure sounds more difficult than the actual operation, which was performed relatively quickly and easily. Procedure involved stripping the old stator coils and punchings, removing the top half of the generator outer frame, placing the pre-wound stator in position, replacing the top half of the generator frame and completing the keying operation.

Converting the generator to 60-cycle required in addition a complete new rotor and exciter. The cooling requirements of the new stator called for 45,000 cu.ft. of air per minute in comparison with the 80,000 cu.ft. of air per minute for the original 25-cycle stator. The old 25-cycle field rotor was of the two-pole, built-up type, the new rotor was a solid forging, four-pole type, and, therefore, very stable. New blower fans designed for the new speed of 1,800 r.p.m. were installed on the rotor. The stator frame was arranged with horizontal ventilating ducts cut through the circumferential rings of the inner frame. These ducts carried the air to a central annular space around the center of the stator windings. From this chamber the cooling air passes horizontally along the air gap and outward through the windings to the discharge duct leading to the cooler.

The Baker balancing equipment was used to balance the unit at the new running speed and the very smooth performance obtained in a minimum of time speaks well for this method.

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Electrical Specialties
High and Low Voltages

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That's why inspectors, trouble-shooters and stock-clerks like COLORTOPS. They know the size instantly by the color. They also like the safe shock and vent-proof top—and they know that a million in a million show when they blow.
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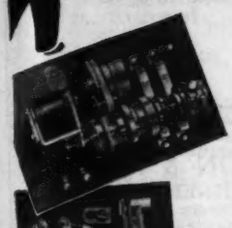

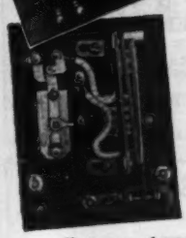

It isn't an accident that the name Dunco stands symbolical of highest quality in the minds of the world's most discriminating users of Time Delay Relays. It is the direct result of years of specialization; years of close contact with all types of problems; plus the manufacture of a large, quality line which lends itself to countless adaptions for specific timer applications. Dunco engineers welcome the opportunity to make suggestions. Dunco Relay Book sent free.

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Crapo Galvanized Strand and Telephone Wire can be obtained readily in all standard grades and sizes.

Good Planning a "Must" in Wiring Sales

[*Continued from page 49*]

The wiring promotion salesman (we call them zone salesmen) work in close co-operation with home-lighting girls and domestic appliance salesmen. Our home-lighting girls have a keen realization of the value of adequate wiring.

Some progress has been made with the speculative builder. Usually the speculative builder is in business for the money he can make, and if his customers demand other features in preference to good wiring, he can't be criticized for giving them what they think they want. Therefore, the man who buys the home is the one to be educated.

In certain parts of the territory it was found that building-material supply companies provided complete building plans for their customers, including electrical layouts. In several such cases we have succeeded in securing the adoption by them of *our standards* for wiring. We have co-operated with builders in "demonstration homes."

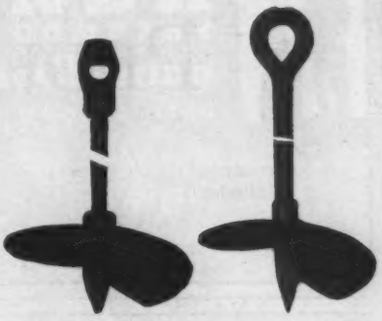
We have attempted with some success, we believe, in enlisting the active support of the appliance merchandisers. With them it is a problem of self-interest. Adequate wiring is necessary for the sale, and also for the proper operation of their appliances.

The objective in all of this promotional activity, of course, is to bring about the co-operation of all interested groups in the promotion of adequate wiring, by appealing to the self-interest of each group in this promotion.

Free Wiring

This is a subject that might well be avoided in a discussion of this kind, but I come back to my original statement, namely: "No two companies are doing the job exactly alike. Conditions in the field vary and organizational set-ups are different."

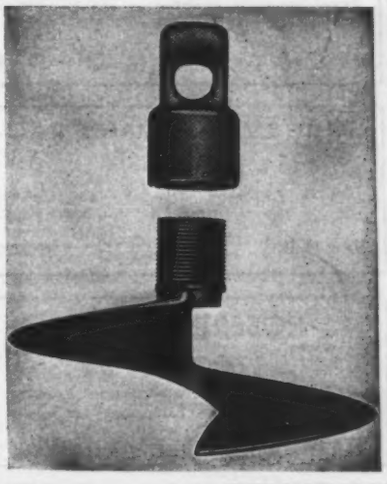
Some companies are providing free wiring for ranges and water heaters; some companies have done so and have quit; others have never gone into it. My company—or rather division—belongs in the latter group. We have never provided free wiring. Our range sales number about 1,800 per year. With free wiring, we estimate that sales could be increased to 2,200



Matthews Scrulix Anchors

shown above were first put on the market in 1900. The one on the left is put down with a wrench. The one on the right is screwed down by putting a bar through the eye. The one shown at the bottom of this column is for use in swampy places and is put down with standard 1½ or 2-inch pipe.

Over 3,000,000 Matthews Scrulix Anchors have been sold and thousands of them are purchased every year. This type of anchor is ideal for use in dry loose sand, loamy ground; under shallow stands of water; on beaches and in swamps. They are made in sizes ranging from 4 inches in diameter to 12 inches. You will find that the 4-inch size will help reduce costs on those cheap rural lines. They will save you money over any anchor that requires the digging and filling of holes. Write for Bulletin 804.



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YOUR card here builds prestige for you and helps to make your name familiar in the field. The cost is extremely small in proportion to its value as a business aid.

ranges per year. Therefore, we would have to stand the expense of wiring 2,200 ranges in order to sell the additional 400 ranges. In other words, the increased cost of selling these additional 400 ranges over and above normal selling cost would be approximately $135 per range.

My personal opinion is that the same amount of money spent for additional salesmen and for sales promotional work will get more ranges and adequately wired homes.

Summary

1. The industry as a whole has recognized the importance of, and is beginning to do something about, adequate wiring.

2. Adequate wiring will result in more appliance sales for the manufacturer, jobber and dealer; more jobs and more profitable jobs for the wiring contractor; increased kilowatt-hour sales for the utility, and better service for the customer.

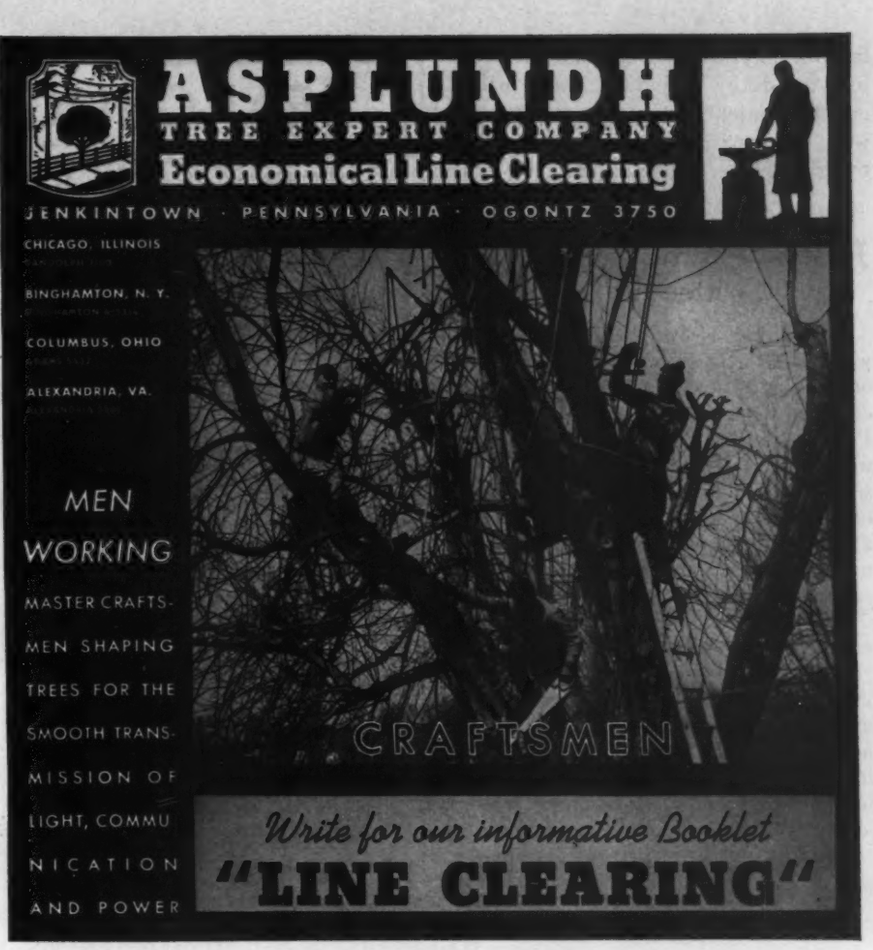
3. The utility within its operating area, or some other representative group, should supply the leadership that will unite all interested parties in working for and promoting better wiring installations. The industry must tell a united story. This is essential, not only for the business leaders and their salesmen, but for every contact employee, even—or I might say especially—including the journeyman wireman.

4. The home owner must be convinced of the necessity for proper wiring and must be persuaded to demand this feature of his building contractor. Early sales contact prior to the complete development of his building plans is essential to secure results.

5. The major burden of actual promotion must be carried by the utility. A high type of salesmanship by well-trained salesmen is essential.

6. Evidence is available to indicate that the most effective results per dollar of sales expense can be secured on new homes or homes that are being remodeled. However, many opportunities are available to sell better wiring in old homes and should not be neglected.

7. Commercial lighting, appliance and home lighting salesmen all report that one of their greatest sales resistances is inadequate wiring. Therefore, it follows that money spent for wiring sales promotion through a coordinated, well-directed sales plan will reduce the selling cost of elec-



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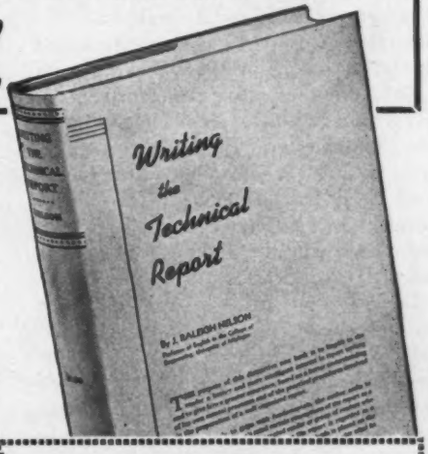

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trical appliances, will facilitate utility load-building activities and will create greater customer satisfaction with the service the electrical industry has to offer.

•

Jersey Central Opposes Electric Rate Cut

Contending electric rates in effect yield a return of only 6.05 per cent on the present "fair value" of the electric department, Jersey Central Power & Light Co. has filed a brief with the state Public Utilities Commission opposing any rate cut now under consideration by the commission as a result of extended hearings into valuation of the company's electric property.

"Respondent has contended for a rate of 6¾ per cent," the brief states, "as being necessary to produce earnings sufficient to continue the efficient management and operation of its business to meet the growing demands of its consumers and to be in a position to render efficient and adequate service to its consumers and, as well, maintain its financial integrity at all times so it may attract additional capital."

•

Charged With Vandalism

Two East St. Louis, Ill., linemen were charged recently with malicious destruction of property in warrants issued at Edwardsville in the wrecking with rifle bullets of three transformers of rural electrification lines belonging to the Southwestern Electrical Co-operative, Inc. The men are Woodrow Couch and L. J. Day. Damage to the transformers was estimated at $4,500. They were destroyed the night before a hook-up of the rural lines to the lines of the Illinois-Iowa Power Co. was scheduled to be made. Frequent labor disputes have taken place since work on the system began. The men were remanded to the custody of the United States marshal until they schedule bond of $2,500 each. No date was set for their hearing.

•

Changes Fiscal Year

Announcement has been made that the annual meeting date of the Eureka Vacuum Cleaner Co. has been changed from February to the last Tuesday of October, beginning this year, and the fiscal year has been changed to end on July 31 instead of December 31. Another amendment provides that all directors must own stock in the company.

SEARCHLIGHT SECTION

(Classified Advertising)

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An advertising inch is measured ⅞" vertically on one column, 3 columns—30 inches—to a page.

Copy for new advertisements must be received by 10 A. M. Monday for the issue out Saturday.

OFFICIAL PROPOSALS

Bids: April 4 (67)

Transformers and Circuit Breakers

SOUTH CAROLINA PUBLIC SERVICE AUTHORITY
SANTEE-COOPER PROJECT
DOCKET NO. 4329 P. R.

1. TIME AND PLACE OF OPENING BIDS: Sealed proposals for furnishing station service and main power transformers and circuit breakers for the Pinopolis Power Plant will be received by the South Carolina Public Service Authority at the office of the Engineer, Harza Engineering Company, 27 Cumberland Street, Charleston, South Carolina, until 10:00 a. m., April 4, 1940, at which time the proposals will be taken to the Ballroom of the Francis Marion Hotel where they will be publicly opened and read.

2. PROCUREMENT OF PLANS AND SPECIFICATIONS: Proposals must be submitted on the forms furnished by the Authority. These forms along with other contract documents including plans and specifications may be obtained from the office of the Secretary of the Authority, Room 508, Peoples Office Building, Charleston, S. C., upon payment of $10.00 for the first set and $3.00 per set thereafter. No refund will be made. These documents may also be examined free of charge at the office of the Authority, Columbia, and Charleston, S. C., and at the offices of the Engineer, 27 Cumberland Street, Charleston, S. C., and 205 W. Wacker Drive, Chicago, Illinois.

3. DESCRIPTION OF WORK: The Pinopolis Power Plant is located about 32 miles northerly of Charleston and 4 miles north of Moncks Corner, South Carolina. The site of the work is approximately one-half mile west of the main line of the Atlantic Coast Line Railroad to which it is connected by a branch railroad.

The work will include furnishing four 34,000 kva and one 11,350 kva forced air cooled outdoor transformers with lightning arresters, two 1,000 kva indoor self cooled transformers and fourteen 115 kv, 1,500,000 kva circuit breakers.

4. BIDDER'S BOND: Each bid must be accompanied by a certified check or bidder's bond executed by the bidder and a surety company licensed to do business in South Carolina and countersigned for the Surety by an agent or attorney-in-fact who is a bonafide resident of the State of South Carolina, in the sum of not less than five (5) percent of the amount of the bid. This is required as a guarantee that if the bid is accepted, a contract will be immediately entered into and the performance of it properly secured. The certified check or bond will be returned upon non-acceptance of bid or execution of contract.

5. WITHDRAWAL OF BID: No bid may be withdrawn for a period of thirty (30) days after the date set for opening of said bid. The Authority reserves the right to reject any or all bids and to waive informalities therein.

6. LICENSES: Bidders not fabricating any shop work in South Carolina will not become general contractors of South Carolina and will not be required to secure General Contractor's Licenses.

The General Counsel of the South Carolina Tax Commission has ruled that manufacture outside of the State, and shipping machines to the site of the project, is not subject to bidders' or Contractors' License Taxes under Section 2543 of the Civil Code of 1932.

Bidders not exempted under the above paragraphs will be required to show issuance of such licenses before his bid is opened or considered.

7. VIEWING SITE: Prospective bidders will be given assistance in viewing the site of the work upon application to the offices of the Harza Engineering Company, 27 Cumberland Street, Charleston, S. C., or Pinopolis Dam site near Moncks Corner, S. C.

By order of the Board of Directors.
SOUTH CAROLINA PUBLIC SERVICE AUTHORITY
By TOM B. PEARCE,
Chairman

ATTEST:
CHARLES H. GERALD,
Secretary.

POSITIONS VACANT

ENGINEERING DESIGNER for high and low voltage air circuit breakers, preferably one having some interrupting test experience on same. Give full details. P-737, Electrical World, 330 W. 42nd St., New York, N. Y.

ELECTRICAL ESTIMATOR. Electrical Graduate, familiar with labor and material costs, with broad experience on substations, primary and secondary power and lighting systems in industrial plants. Give complete training and experience record and salary desired. Location Michigan. P-743, Electrical World, 520 N. Michigan Ave., Chicago, Ill.

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EXECUTIVES AND TECHNICAL MEN. Contact employers for positions through our confidential and effective methods. We negotiate preliminary overtures. Established 24 years. Inquiries invited. H. H. Harrison, Director, The National Business Bourse, 20 West Jackson Blvd., Chicago.

ADDITIONAL EMPLOYMENT and Used Equipment advertising will be found on opposite page